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MARCH, 1908.

Edited by WILLIAM MORTON WHEELER.

Publication Committee.

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JOURNAL

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VOL. XVI.

MARCH, 1908.

No. 1.

NOTES ON THE LIFE HISTORY OF DATANA ROBUSTA STRECKER.

By W. S. WRIGHT,
SAN DIEGO, CALIFORNIA.

On November 13, 1906, I took a large number of larvæ of *Datana robusta* on *Rhus laurina*. They were then nearing the end of the final stage, and in a few days all had pupated. I placed the pupæ in a dry place for the winter, and early in the summer of 1907 sifted them out of the dirt and rubbish and placed them in a cage in a moderately dry cellar. July 13 they began to emerge and on the twenty-seventh I found a pair in copulation; these were isolated and on the twenty-ninth near sundown the female deposited her eggs.

Not being able to spare much time, and being somewhat inexperienced in life-history studies, I sent some of the eggs to Mr. Fordyce Grinnell, Pasadena, Cal., who consented to describe the caterpillars in their different stages, while I was to make notes on their habits, etc.

Mr. Grinnell's larvæ died in the third stage, but I supplied him with material for the fourth and fifth stages; in his descriptions stage three is missing but I have supplied it from my own notes.

I have presented my notes in full, making little attempt at abridgment, trusting that whatever they may lack in value will be made up in added interest.

July 30. About sundown last night I observed the female depositing eggs in a mass on the wood near the bottom of the cage. There are 90 eggs in the mass. The egg is about .8 mm. in diameter, subglobular, pearly white, the surface having the appearance of parchment. A semitransparent spot at the apex is slightly depressed, forming a shallow pit. The base is somewhat flattened.

Note. — Later in the month I took several masses of eggs on the food plant. They were laid indifferently on either side of the leaf but always near the apex. Of six masses counted the number varied from 90 to 180, there being more than 800 in the six masses.

August 2. The two moths in the cage are dead. No change noted in the egg.

August 16. The eggs laid July 29 hatched this morning early. Only two eggs failed to hatch. The little caterpillars are light green, or greenish yellow in color, with large black heads. In leaving the egg they eat out the top, leaving a round hole.

August 17. The young larvæ are eating out the upper epidermis and parenchyma of the leaf through to the lower skin. They are huddled together in a rather compact mass. All are quite lively.

August 18. Very little change since last observation. Head shiny black, body yellow-green, excreta greenish and collected in small masses on the leaves and held together by a fine silky web. The surface of the leaf over which they have fed is covered by a web.

August 19. The little caterpillars have increased to about double the size at hatching. Just back of the head is a transverse black spot or plate from which rises several long white hairs, the whole having the appearance of a collar. At the anal end are two blackish tubercles (probably anal feet) from each of which arises a star of hairs or spines some four or five in number. The whole body is more or less covered with white hairs. The latter half of the body is of a pinkish color.

August 20. Bodies becoming red. Four well-defined yellow lines have appeared on each side of the body, extending from the head to the anal extremity. They are feeding rapidly, generally on the upper side of the leaf, leaving the veins and the lower epidermis intact.

Note. — I have noticed that the young larvæ feeding out of doors always feed on the upper side of the leaf, and have judged that the selection of this particular surface is due to the fact that in this species of *Rhus* the leaves are inclined to fold along the midrib bringing the upper surface of each side together, so that the little caterpillars are afforded a measure of protection.

An interesting habit was noticed to-day for the first time. When slightly disturbed, the larvæ raise the head and strike downward and to one side, bringing the head nearly to the surface of the leaf. This striking is done nervously but in strict time, the whole colony performing together.

August 21. All resting ; head and anal extremities raised in characteristic attitude. Yellow lines a little more distinct. Some increase in size noticeable.

August 22. 8 A. M. So far as I can see there is no change since last observation. Perhaps the body is a little larger and the color a trifle deeper. The yellow stripes nearest the dorsal are somewhat blended by the clouding of the interspace.

Note. — I have come to the conclusion that there are no anal feet as in other larvæ that I have observed. The tubercles that were noticed in a former observation are in all probability anal feet that have for some reason degenerated into tubercles, and clothed themselves with hairs or spines either as a matter of protection or for some physiological reason. When excreta are cast they cling to the hairs on these organs and are gradually worked off until free from the body. In the younger stages the excreta are often held together in long bead-like strings.

6 P. M. Still at rest or moving in a sluggish manner. Just back of the head there appears to be a slight constriction. In some specimens there is a small area between the head and the beginning of the body color ; this area is transparent or a watery pink. The body is quite thick as compared with the head, which has heretofore been the most prominent part of the caterpillar.

August 23. 7 A. M. One caterpillar has moulted. The head is very light pink and semitransparent. The red of the body is somewhat darker. The stripes are more accentuated, hairs more prominent, white. A collar of longer hairs is seen just back of the head.

3 P. M. Practically all have moulted. The head has turned a shiny jet black. A few are moving about restlessly ; none are feeding.

August 24. 8 A. M. The caterpillars have been eating during the night. They are now eating through the whole body of the leaf, feeding along its edge.

7.30 P. M. Clinging in small masses to the leaves and eating ravenously.

August 26. Increased size the only perceptible change. All at rest on the back of the leaf away from the light ; this is the only time I observed that they were particularly affected by the light. They ate very heavily during the night.

August 27. 8 A. M. Ate heavily during the night. About half an inch in length. Color becoming darker.

7.30 P. M. All quiet now and evidently preparing to moult.

Note. — When about to moult the skin breaks just back of the head and gradually works backward ; I have never been able to detect the slightest motion on the part of the caterpillar during the process of moulting. The head covering separates from the skin and is pushed forward, coming off like a little cap ; it often remains on the head until the skin is nearly or quite free from the body. After the moult is completed they rest for some hours before beginning to feed.

August 28. 8 A. M. Nearly all have moulted this morning. The hair is somewhat thicker and longer than at last moult, also the color is somewhat darker and the yellow lines more distinct.

7.30 P. M. Moult complete and the caterpillars eating rapidly. Body color much darker than this morning. Hair so long that the larvæ look almost shaggy.

August 31. The caterpillars have been very active all day and have fed heavily. A considerable increase in size is to be noticed. The color is getting darker.

September 2. Fed heavily last night ; no change perceptible.

September 3. 6.30 A. M. The first stage of the third moult has begun. The skin has broken away from the head and the lobes of the new head have begun to push themselves out. The caterpillars are in a compact mass on a stem and are motionless.

7.30 P. M. Moult complete. The caterpillars were bright red when they first emerged but turned brownish black within two hours. The hair is long and quite shaggy.

September 4. Feeding heavily and growing proportionately. Body color quite black, accentuating the yellow of the lines. The hairs are quite white and much more conspicuous than heretofore.

September 7. Caterpillars stopped feeding this morning and are about ready to cast their skins. The skin has broken just back of the head, and the new head appears as a slight swelling between the old skin and the old head covering.

September 9. Caterpillars completed the moult last night and are now of a deep black color, slightly tinged with brownish. Stripes yellow tinged with green. Head black and shiny. Hair white and quite long. They are eating but sparingly.

September 13. Caterpillars the same in appearance as at last observation ; not feeding much this morning. During the last few days they have eaten voraciously. They have grown in length and

are now about two inches in length, black in color, stripes less prominent. They have rested but little during this stage, but have rather been constantly on the move. At five this evening they are at rest or wandering aimlessly about the cage. The leaves are eaten in spots only. There is slight enlargement of the body just behind the head much as in the previous stage just before moulting though the skin is not broken.

September 14. At 8.30 this evening the last caterpillar entered the earth to pupate.

RECAPITULATION.

Eggs laid July 29, larvæ emerged August 16, 18 days.

First stage August 16 to August 22, first moult, 6 days.

Second stage August 22 to August 28, second moult, 6 days.

Third stage August 28 to September 2, third moult, 5 days.

Fourth stage September 2 to September 9, fourth moult, 6 days.

Fifth stage September 9 to September 14, fifth moult, 5 days.

Pupa. — The pupa remains in the earth until July or August of the following year.

Datana robusta Strecker.

Egg.* — Laid in a cluster on the leaves of the food plant. Spherical or subpyriform; white; smooth or very lightly punctured. A slight depression at apex, with a minute black point in the center. The larva eats a circular but very uneven exit from the egg. Hatched August 15, 1907, P. M.

First Stage. — Head black; wide. Body light honey yellow, transparent, the internal organs showing through, a dark subdorsal shade; cervical shield, anal plate, and anal legs, black; thoracic and abdominal legs partly black. Tubercles black, from which arise long black hairs, as well as from the anal feet. The anal feet and posterior part of the body are slightly elevated in repose. They live together in a rather compact colony.

Second Stage. — Changed August 18. Has the characteristic attitude of *Datana* larva with elevated cephalic and anal parts. Head black, shining, punctured. The body is about the same as in the first stage, the hairs shorter; the dark subdorsal band more distinct. Body not so transparent. Tubercles smaller. The subdorsal band is a decided blood red, extending the whole length of the body.

Third Stage. — Length .50 inch; width .05 inch. Head slightly wider than the body, punctate, sparsely covered with short whitish hairs, distinctly bilobed (not deeply) above. Clypeus smooth and shiny.

Cervical shield, suranal plate and anal legs shiny black and clothed with watered hairs; hairs on the suranal plate and anal legs black.

* These descriptions, except that of stage three, were prepared by Mr. Fordyce Grinnell, Jr.

Dorsal band deep blood red, .02 inch wide. Three subdorsal yellow lines straight, even, extending the whole length of the body. The first and third lines with minute black tubercles in the center of each body segment, some of them twinned, a white hair rises from each tubercle,

Body rather evenly clothed with rusty-white short hairs, thicker along the line of the legs, longer hairs rising from minute black tubercles. Anal extremity from the last pair of abdominal legs constantly erect. Hairs on the anal legs and suranal plate rather stiff and spine-like.

Spiracular line yellow, interrupted at the sutures, wavy in appearance, somewhat broader than the subdorsal lines. Spiracles black.

Abdominal legs (pro-legs) red, with a shiny black plate on the outer side, hairy. Thoracic legs conical, black and shining.

Subventral lines much interrupted at the sutures; ventral line pale but distinct, continuous.

Note. — After receiving the notes on the various stages from Mr. Grinnell, I described the third stage from a lot of larvæ which I had been rearing for specimens. The eggs from which these larvæ came were gathered about the first of October. The larvæ described were in the third day of the stage. During the last three days of the stage the larvæ increased to quite one inch in length but were in all other respects as described above.

Fourth Stage. — Head black, shining, strongly punctured, a little wider than the body, tapering; a few long whitish hairs arise from the head. The body is dark brown or black in color, with three yellow subdorsal bands, running the whole length of the body, wavy in outline, uneven. Body covered with long white hairs, more densely and in tufts from the subventral region. Anal legs conical, black. The cephalic and caudal regions upheld constantly. Exudes a drop of brownish fluid when disturbed.

Fifth Stage. — Head large, black, slightly bilobed, almost as wide as the body, tapering. Prothoracic shield black. Body covered with a fine whitish down or pile, intermixed with a few longer hairs. The stripes are very faint in color, narrow, light yellow, extending the whole length of the body, somewhat interrupted intersegmentally. Body slightly tapering posteriorly.

Pupa. — Body long, thick towards the cephalic part, tapering gradually to the anal extremity. Head slightly projecting, bilobed. Body dark brownish, covered with many rather coarse punctures, a few only confluent. Spiracles large and conspicuous. Wing cases more coarsely punctured.

The early stages of *Datana robusta* (Strecker) much resemble those of *D. perspicua* (Grote and Robinson) as described by Packard in his "Monograph of the Bombycine Moths," 1895. The adults are also very similar.

DESCRIPTIONS OF NINE NEW SPECIES OF GNATS.

BY EVELYN GROESBEECK MITCHELL,

WASHINGTON, D. C.

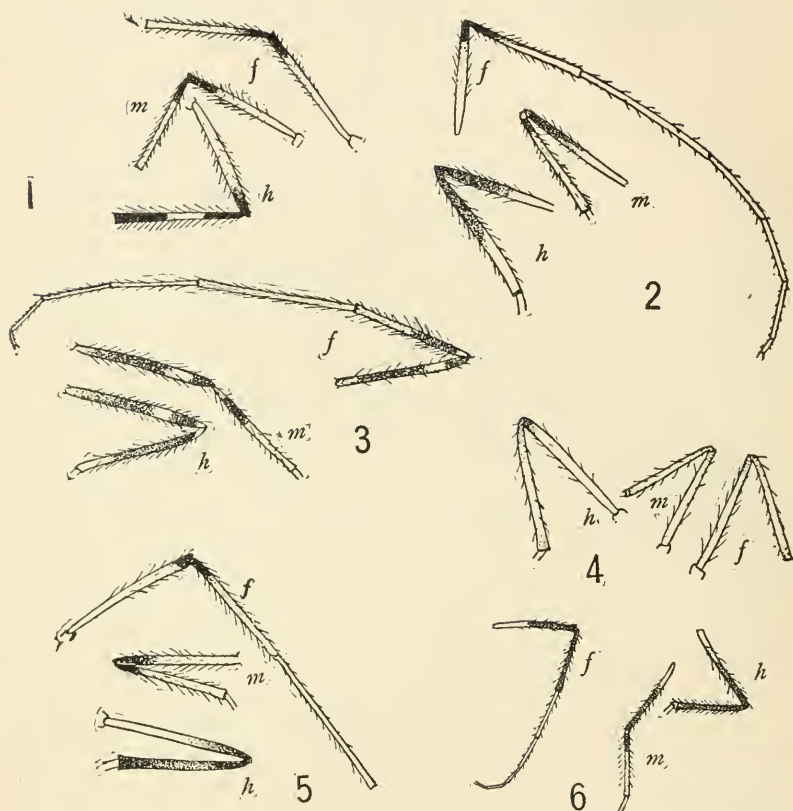
While investigating the early stages of the Chironomidæ of the District of Columbia, during the summer of 1905, the writer obtained the first five of the new forms herewith described. While comparing these with the specimens in the National Museum the last four species were discovered in the museum collection. As these species are differentiated among themselves and from the most nearly related species (*C. pulchripennis* (figs. 7, *b*; 2) and *C. tæniapennis* (figs. 7, *f*; 5)) chiefly by characters of wings and legs, it seems expedient to figure these parts, in order that the new forms may be readily recognized. The figures, except that of *tæniapennis*, are by the author from types. The types collected by the author have been given to the National Museum. I desire to thank the authorities of the U. S. National Museum for the privilege of comparing my specimens with the Museum series and of describing the new species from that series. The descriptions are published here by the sanction of the Museum authorities.

Chironomus nephopterus, new species.

Male.—Antennal hairs gray, quite dark on distal third of antenna; antennal joints dark brown except the first which is rather light; occiput very light brown. Mesothorax cream-color; lateral vittæ red-brown and fringed with deep cream hairs, central stripe light brown; cephalic part of pleuræ almost white, rest tan-brown and white; scutellum creamy; metanotum deep chocolate brown with mesal notch of cream color at cephalic margin and extending in a hair-line down the meson; halteres white; claspers and last five abdominal segments chestnut brown, shading into black on their apical halves, apex of fourth segment tinged with faint brown, rest of abdomen green, venter of abdomen like dorsum. Coxæ white; distal third of femora chocolate brown, remainder creamy (fig. 6); tibiæ of fore and hind legs entirely dark brown, tibia of middle legs brown on proximal third shading to cream with black line at apex; tarsal joints shading from white on the first through deep cream and tan to chocolate brown on the last joint; claws black. Wing (fig. 7, *c*) clear with cinereous costal cell, tip dark for about one half the length of the lower branch of the radius, the mark being blunt wedge-shaped with its tip between the medius and the cephalic branch of the cubitus, a band crossing at the fork of the cubitus and extending half way to the base of the wing on the caudal margin. Length 3 mm. Length of wing $2\frac{1}{4}$ mm.

One specimen. Taken at Cabin John, Md., June 3.

Type.—Male, Cat. No. 11022, U. S. N. M.



FIGS. 1 to 6. Comparison of leg markings: 1, *C. exquisitus*; 2, *C. pulchripennis*; 3, *C. pæcilopterus*; 4, *C. zonopterus*; 5, *C. tæniapennis*; 6, *C. nephopterus*.

***Chironomus calopterus*, new species.**

Female.—Occiput brown with ashy border; antennæ light brown; mesonotum tan with ashy pruinosity; lateral vittæ brown, rather spreading; central vitta also brown, with its outer margins bordered by a narrow green line which fades to light brown; a number of long light hairs on the dorsal margins of the lateral vittæ as well as on the scutellum and metathorax; pleuræ chiefly dark brown; scutellum brown, its hinder margin gray; metanotum brown, very dark at its cephalic margin. Abdomen green in life (this is from a note at time of capture, the abdomen is now gone); halteres white; coxæ and entire legs pale cream color except the very apical margin of the middle and hind tibiz which are black; hairs of legs pale straw color. Wing (fig. 7, *a*) hyaline and crossed by a cinereous band in width a little less than half

the length of the caudal branch of the radius, its hind margin at the small cross vein and extending slightly proximad after crossing the medius; veins dark where crossed by band, radius continuing rather dark to the margin; whole of costa light brown. Length (without abdomen) $1\frac{1}{2}$ mm. Wing length $2\frac{1}{4}$ mm.

One specimen. Taken at Cabin John, Md., June 3.

Type.—Cat. No. 11021, U. S. N. M.

Chironomus hirtipes, new species.

Male.—Antennal joints and hairs smoky, except the first two segments which are tan; vertex and mouth parts tan. Mesothorax rather dark tan, with slight pruinosity, the lateral vittæ light brown, the central rather pruinose continuing in a brown line to the scutellum, a black line running along its lateral margins from the cephalic margin of the mesonotum to the scutellum and spreading in the middle of its length into a distinct triangular dot; scutellum dark brown, with black spots at its lateral margins; metathorax dark tan, with faint black spots on its cephalic margin; pleuræ and coxæ tan-brown. Wings uniformly smoky except at the very base, which is white. Abdomen deep cream or pale tan, lateral brown dots on the first segment, brown basal bands on succeeding segments until the last two are entirely dark brown and tan. Venter tan. Femora and tibiæ (fig. 12) tan with thick covering of dark brown, long hairs, which give a decidedly fuzzy appearance, last two tarsal joints light tan, rest cream. Length 5 mm. Wing length 4 mm.

Three specimens. Taken at Cabin John, Md., June 3.

Type.—Male, Cat. No. 11024, U. S. N. M.

Female.—Vertex of head light tan, antennæ same; mesothorax tan, lighter than in male, with more pruinosity as are also the vittæ; the line on each side of the central vitta brown; pleuræ dark brown, with slight pruinosity and light brown mottlings; scutellum dark tan; metanotum tan shading into two chocolate brown dots on its cephalic margin; wings with slightly more white at base than in male; halteres straw color; abdomen ashy, with creamy hairs, on second and all succeeding segments a basal band of chocolate brown which narrows until it practically disappears on the last, venter very dark brown; coxæ tan; femora and tibiæ tan, with rather thickly set brown hairs but not nearly so fuzzy in appearance as those of the male; first three joints of tarsi creamy, rest pale tan. Length 3.5 mm. Wing length 3.5 mm.

Three females taken with the males at Cabin John. Specimens have also been taken at Ft. Porter, N. Y., on July 3.

Cotype.—Female, Cat. No. 11024, U. S. N. M.

The insects when resting, as is their habit, on the under side of leaves, much resemble little spiders and would scarcely be noticed by one looking for gnats. They are rather more stupid and easy to capture than the average. Although not found in swarms they were locally quite abundant. The females taken at Cabin John laid eggs June 4, about 700 being embedded in a round mass of gelatin. The eggs hatched June 7, but the young larvæ all died.

Chironomus pæcilopterus, new species.

Male. — Vertex of head tan color, antennal hairs silvery gray darkening toward the tips of the antennæ, joints almost black except the first, which is tan; mesothorax deep cream (pale green in life), with silvery pruinosity; median vitta tan, its caudal end bearing two small brown dots; lateral vittæ tan which color extends also over the caudal half of the pleuræ, the cephalic parts of which are creamy; scutellum creamy; metanotum tan, with two dark brown, almost black stripes approaching posteriorly; wings (fig. 7, *c*) bare, hyaline, with costal area cinereous, an irregular cinereous band crossing the wing at the small cross vein and cubitus fork, occupying about one half of the length of the lower branch of the radius and extending irregularly basad along the caudal margin to the tip of the anal vein. A small, cinereous, somewhat wedge-

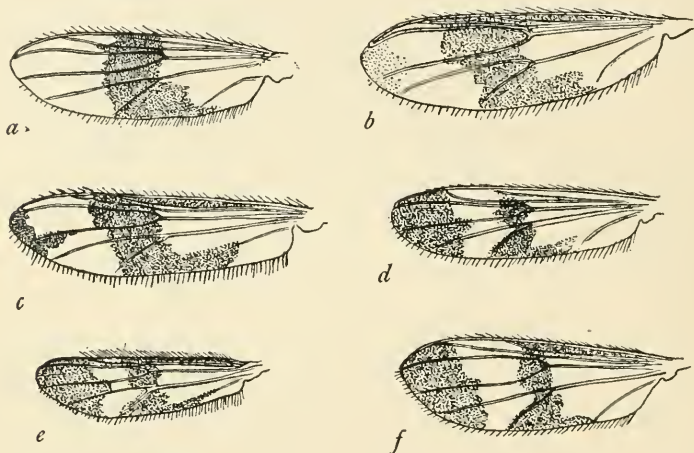


FIG. 7. Comparison of wing markings (not to exact scale): *a*, *C. calopterus*; *b*, *C. pulchripennis*; *c*, *C. pæcilopterus*; *d*, *C. zonopterus*; *e*, *C. nephopterus*; *f*, *C. tæniapennis*.

shaped spot at tip of wing. Abdomen covered with long light-colored hairs, first four segments Nile green in life (fades to cream in death), caudal third of fifth segment and the whole of the succeeding segments and claspers mottled light and dark brown. Legs (fig. 3) fringed with long fine hairs corresponding in color to the parts on which they are; coxæ creamy, also the very bases of the femora, rest of femora dark brown, with creamy band occupying about the middle of the distal halves; proximal half of tibia in middle and fore legs dark brown, except the very base which, with the distal half, is creamy, a dark spot at juncture with tarsi, in hind legs the proximal two thirds of the tibia is dark; tarsi creamy white, claws black. Length 4.5 mm. Length of wing 3.5 mm.

Type. — Male, Cat. No. 11023, U. S. N. M.

Female. — Head and antennæ light tan, thorax as in male, with markings less pronounced and the creamy part having a decided greenish tinge. The median vitta,

which is prolonged as a brown line to the scutellum, is divided by a creamy line on its cephalic half. Pleuræ entirely brown; caudal part of scutellum brown; metanotum much darker than in male. Abdomen with long silvery hairs, first three segments pea green, with dark, indefinite, mesal marking becoming quite pronounced on the fourth, spreading into a basal band, slight on the fifth, which segments are silvery pruinose on sides, apical third of segments three to five greenish white, basal half of the seventh and eighth segments black and their apical halves greenish white. These dark markings are very variable and may be confined to the last two or three segments. Femora as in male, the band very pronounced, proximal half of first, third of second and two thirds of third tibiæ (except for a light spot just distad of knee) dark brown, the rest creamy, the articulation with the tarsi black as also the articulations of the tarsi and claws. Hairs not so long as on the legs of the male. Entire venter of the abdomen dark instead of corresponding with the dorsal markings as in the male. Length 4.5 mm. Wing length 4 mm.

Cotype. — Female, Cat. No. 11023, U. S. N. M.

There were six males and two females taken at Cabin John, Md., June 6. Both females laid eggs the tenth. They were about 200 in number and arranged irregularly in a rounded mass of gelatin about 3.5 mm. in diameter (fig. 8). The outer coat of the gelatin has a peculiar appearance under the microscope, as if of myriads of short lines directed toward the center of the mass. The larvæ were hatched June 11, and the last died July 29. They make houses on the bottom of the jar from grains of sand and bits of *Spirogyra*, using rather large bits of sand.

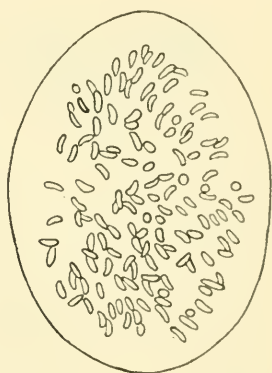


FIG. 8. Egg mass of *C. pacillopterus*.

Chironomus exquisitus, new species.

Male. — Antennal joints dark, except first, which is tan colored; hairs of antennæ cream colored on proximal three fourths of antennæ and cinereous on distal fourth; occiput creamy. Mesonotum practically white (probably green in life) the vittæ brown, bordered by golden brown, the anterior ones distinctly divided into two; pleuræ pale brown; scutellum white; metanotum black divided by white line at meson. Last four abdominal segments and claspers black with faint tan mottlings, fifth segment black on distal, yellow on proximal, half; rest of abdomen Nile green; the whole covered with long, straw-colored hairs. Wings (fig. 9, c) hyaline, the costal cell clear, tip cinereous, this color extending over a little less than the distal fourth of the wing, a narrow cinereous band at cross vein extending from R to caudal margin and along the latter about as far as the anal vein. Legs (fig. 1); coxæ greenish white; femora white except for black band occupying about the distal fourth (a little more on the last two pairs than on the first), about the proximal fourth of the

fore and middle tibiae black ; the extreme apex of middle tibiae black ; middle third of hind tibiae white, the remainder black or very dark brown ; tarsi of fore legs green, those of other legs white ; the legs with rather long hairs corresponding in color to the parts on which they are. Length 4.5 mm. Wing length 3 mm.

Taken at Cabin John, Md., June 10.

Type. — Cat. No. 11141 U. S. N. M.

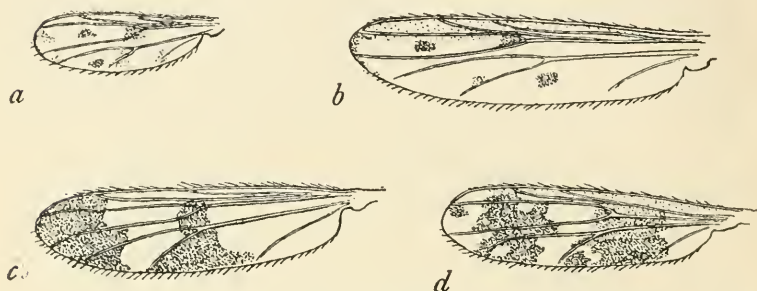


FIG. 9. Wing markings (not to exact scale): a, *C. labeculosus*; b, *C. nervus*; c, *C. exquisitus*; d, *C. perpulcher*.

Chironomus zonopterus, new species.

Male. — Antennal joints brown except the first which is tan color, hairs dirty yellow ; palpi brown ; occiput light yellow ; mesothorax light yellow with three deep tan brown vittae ; scutellum yellow ; metanotum tan (quite dark in one case) ; pleurae yellow as also the first five segments of the abdomen (these yellow parts, by traces of color on one of the specimens, are doubtlessly green in life), last four segments and claspers much mottled with black. Wings (fig. 7, d) hyaline with two smoky bands, one at the tip quite wide, irregular, distinct, occupying most of the distal part of the wing, the other at the cross vein and fork of cubitus narrow, very irregular, somewhat more indistinct than the other band and extending along the caudal margin almost to the anal vein, costal cell hyaline. Legs (fig. 4) pale yellow except for brown claws and faint brown tints at knees, both on femora and tibiae especially noticeable on hind pair, apices of tibiae, especially hind pair, also tinted faintly brown, their very apical margins black. Length 4.5 mm. Wing length 3.5 mm.

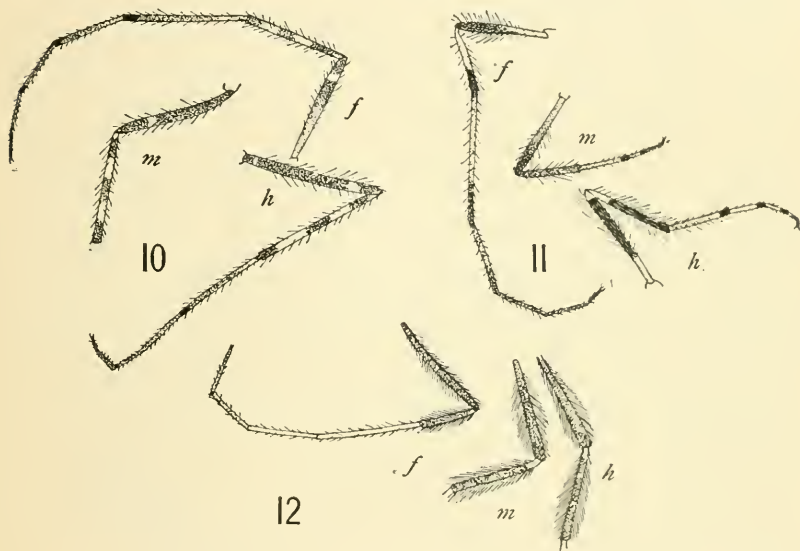
Two specimens, the type from Clementon, N. J.

Type. — Male, Cat. No. 11025, U. S. N. M.

This species appears to differ from the extremely closely related *C. fascipennis* Zetterstedt in that the band at the tip of the wing is very broad rather than moderate, the middle differs in width and general outline from that of *C. flexilis* Linné (which the band in *fascipennis* is said by Zetterstedt to resemble), by lacking a dark spot at the base of the wing, and by possessing darker metanotum, knees and terminal portion of abdomen.

Chironomus perpulcher, new species.

Male. — Antennæ, both joints and hairs, black, with brownish reflections; head black. Mesonotum polished, the wide, golden brown vittæ separated by very indistinct, light lines; rest of body chocolate brown or black except claspers, which are mostly white. Wings hyaline, the tips clear, two chestnut brown bands completely crossing wing, the distal one mottled with clear spots and occupying the middle part of the space between tip and cross vein, the proximal band extending in width from cross vein about half way to base of wing (fig. 9, *d'*). Legs (fig. 11), coxæ black at bases, white distally; fore femora yellowish white on proximal, black on distal half; middle femora light brown on proximal two thirds, chocolate brown to black on



FIGS. 10 to 12. Comparison of leg markings: 10, *C. nevus*; 11, *C. perpulcher*; 12, *C. hirtipes*.

distal third; hind femora black on distal three fourths except for snow white tip, remainder creamy; fore tibiae snowy on proximal two thirds, distal third black; middle tibiae deep chestnut brown; hind tibiae snow white for about the basal fourth; remainder black; front tarsi with first joint chocolate brown at very base, also for about distal fourth, remainder pale brown, second joint about the same, other joints chocolate brown to black at claws; middle tarsi, first three joints yellowish brown with black on the distal fourth, third and half respectively, last two joints black; hind tarsi, first four joints yellowish white with black on distal fifth, fourth, third and half; last joint light brown. Length 4.5 mm. Wing length 2.5 mm.

Female. — Practically the same as the male.

Taken at Plummer's Island, Md., August 11, by Dr. A. K. Fisher.

Type. — Male, Cat. No. 11142, U. S. N. M.

Chironomus labeculosus, new species.

Female. — Antennæ, head and entire body chocolate brown. Legs clothed with light yellowish hairs; pale brown, the proximal parts of the femora somewhat more darkly shaded. Wings (fig. 9, *a*) hyaline, with no distinct banding, a cinereous spot in the middle of cell R^5 , a larger one at the cross vein, one on caudal margin in center of cell C^1 , an indistinct mark at the base of this cell, another on the anal vein, tip of wing with faint mark. Length 1.5 mm. Wing length 1.75 mm.

Taken at Hot Springs, Arizona, June 27, by Mr. H. S. Barber.

Type. — Female, Cat. No. 11144, U. S. N. M.

Chironomus nævus, new species.

Male. — Head wanting. Mesothorax brownish black, the vittæ dark gray, scutellum chestnut brown; metanotum chocolate brown; pleuræ dark brown. Wings (fig. 9, *b*) clear, with four cinereous dots, one in the middle of cell R^5 , one at the cross vein, a spot in cell C^2 and a very indefinite spot in cell C^1 close against vein C^2 , there is a faint band on the tip of the wing in cells R^5 and M^3 and the costal margin as well as the upper third of cell R^5 has a very slightly smoky appearance. First five abdominal segments chestnut, with scattered black scales, segments two to five with a median black stripe, the last segments dark gray with brownish reflections and scattered black scales, the first six segments with an apical white band in width one fourth (or slightly less) the length of the segment; claspers brown and black. Legs (fig. 10), coxæ dark brown; femora dark brown, lighter on proximal half of the fore femora, with a narrow white band at base of apical third in the middle pair and fifth in the other two pairs, and, in the hind pair, a very small, yellowish white band at base; white knee spots; tibiæ dark brown with two white bands occupying about the second and the fourth fifths from the base; first joint of front tarsi creamy on basal fifth shading through brown to black at distal end, second joint creamy at extreme base shading also to black, third and fourth joints brown shading to black, fifth black; tarsi of middle pair gone; first joint of hind tarsi black at extreme base followed by a narrow creamy band and then shading through brown to black at tip, other joints shading from brown on the second to black on the last. Length 6.5 mm. Wing length 4.5 mm.

Taken at Beulah, N. M., in August, at an altitude of 8,000 feet, by T. D. A. Cockerell.

Type. — Male, Cat. No. 11143, U. S. N. M.

LENGTH OF THE LIFE-CYCLE OF PSEUDOPYRELLIA CORNICINA FABRICIUS FOR A SINGLE GENERATION, WITH RECORD OF A PARASITE.

BY A. ARSÈNE GIRAULT,

WASHINGTON, D. C.

On the morning of August 20, 1907, at New Richmond, Ohio, I found a single mass of 66 eggs of this common coprophagous species freshly deposited on cowdung in a meadow. These were taken up and placed on fresh droppings in the laboratory. They hatched at about six o'clock on the morning of August 21, and the larvæ at once entered into the dung.

By noon of August 23, the maggots were of some size, and pupation followed two days later, at 6 P. M., August 25, average time. The flies commenced emerging nearly simultaneously at 7 A. M., September 2, and again at about the same hour, September 3, making the average time of emergence, 7 P. M., September 2. The table shows the duration of the different stages:

No. Eggs.	Deposited.	Hatched. Egg Stage.	Pupation. Larval Stage.	Emergence. Pupal Stage.	Length Cycle.	Avg. Effective Temperature, Degrees Fahr.
66	A. M., Aug. 20.	A. M., Aug. 21. ± 1 day.	6 P. M., Aug. 25. 4 days, 12 hours.	7 P. M., Sept. 2. 8 days, 1 hour.	13 days, 13 hours.	31.8°

The eggs when first obtained were placed on fresh cow droppings confined over moist loam soil in a glass jar, covered with cheese cloth. This jar was confined in the laboratory, out of direct sunlight. The adults lived for two weeks after emergence, similarly confined over human excrement, but they did not deposit eggs; they were confined singly, and also in numbers together.

About noon, August 20, adults of the parasitic *Cratospila fuscipennis* Brullé were frequently observed crawling over piles of cow droppings, and a few of them were seen probing their ovipositors into the half-grown maggots of *cornicina*. Afterwards, many were reared from these larvæ brought into the laboratory. They appear to be quite abundant in that locality of Ohio. This is the first recorded parasite.

A few adults of *Sarcophaga* species, many of *Sepsis violacea* Meigen, and a few of another Muscid dipteran, were reared from the droppings infested with *cornicina*.

The determinations of the Diptera were made by Mr. Coquillett, and of the hymenopteron by Mr. Crawford, both of the U. S. National Museum, through the kindness of Dr. L. O. Howard.

ON NORTH AMERICAN AND SOME CUBAN COPELATUS.

BY CHARLES SCHAEFFER,
BROOKLYN, N. Y.

Copelatus cælatipennis Aubé, Spec. Gen., VI, p. 382.

I have taken a specimen in Brownsville, Texas, and Mr. Roberts has a number of specimens from Sanford, Jacksonville and Taylor County, Florida, which are referable to this species. It is near *glyphicus*, but dull, not shining, generally smaller and narrower; apices of elytra feebly attenuate and subacute; thorax in both sexes with very fine scratches over the entire surface; the front tibiæ at base distinctly curved on the upper edge, and the front and middle tarsi of the male much more broadly dilated than in *glyphicus*; the head, thorax, a basal fascia, and generally the sides of elytra, ferruginous, the thorax sometimes darker at middle; base of elytra in both sexes with more or less distinct, short scratches.

Copelatus impressicollis Sharp, Trans. Roy. Dub. Soc. n. s., II, p. 589.

I took a few specimens in the Huachuca Mts., Arizona, which I refer to this species. It is a larger and darker insect than *glyphicus*, with an equal number of discal striæ on each elytron, but slightly shorter at base and apex; front tibiæ of the male are simple and the tarsi much dilated; the thorax has a few scratches at sides in the male, these extend over nearly the entire surface in the female. One female has on the elytral intervals a number of short, impressed, longitudinal lines and between the ninth and tenth striæ and the tenth and the submarginal striæ an additional, but abbreviated stria of somewhat irregular outline. The other female shows scarcely any impressed lines on the disk, but has them at sides; the additional striæ are also present but much shorter and still more irregular.

rows of punctures; the submarginal stria is absent. The female has five or six impressed striæ at sides on each elytron in addition to the discal rows of punctures, but all the striæ are very short and much abbreviated at base and apex, the marginal stria is absent. In one specimen the striæ are much better marked than in the other.

Copelatus cubaënsis, new species.

Form of *glyphicus*, fuscous; underside, legs, antennæ and a transverse basal fascia, paler. Head finely but not very densely punctate. Thorax transverse; hind angles rounded; front angles prominent, acute; impressed on each side, the impression broad near base but narrower towards apex; surface finely punctate and with a few rather indistinct, impressed lines, the punctuation coarser at sides near base. Scutellum smooth. Elytra somewhat prolonged at apex; surface with six entire striæ; sutural striæ abbreviated at base, submarginal striæ not quite reaching to middle; intervals distinctly, but finely punctate, nearly equal in width, the two outer ones slightly narrower than the inner striæ. Underside with more or less distinctly impressed lines. Front tibiæ as in *glyphicus*. Length 5 mm.

Cayamas, Cuba, one female in the collections of the National Museum, collected by Mr. E. A. Schwarz.

Type. — No. 11545, U. S. N. M.

This species, by the number of elytral striæ and the possession of a submarginal stria, has to be placed in Dr. Sharp's group X and is remarkable for being the first species in this group from the New World.

Copelatus angustatus Chev., Ann. Fr., 1863, p. 201.

A few specimens collected by Mr. Schwarz in Cayamas, Cuba, and identified by him as *angustatus* Chev. are before me. This species was unknown to Dr. Sharp, who gave only Chevrolat's short original description on p. 767 of his monograph "On Aquatic Carnivorous Coleoptera or Dytiscidæ." The specimens agree with the description. They are of the form and size of *glyphicus*, but more shining; base, lateral margin and apex of elytra pale, each elytron with two discal striæ, the submarginal not quite extending to base, surface punctate; thorax in the male without, or with a very few fine scratches at sides in the female; front and middle tarsi more dilated than in *glyphicus*.

NEW MOTHS OF THE FAMILY GEOMETRIDÆ.

BY JOHN A. GROSSBECK.

1. *Gymnocelis mellisa*, new species.

Expanse, 15 mm. Palpi and front deep brown, both with a few white scales; vertex with mixed brown and light colored scales. Thorax and first abdominal segment dirty yellowish-white, mixed with a few white scales; remainder of abdomen brown, whitish at the apex of the segments. Ground color of wings dirty whitish overlaid with brown, and washed with brunneous at the base, radial vein, inner margin and outer margin of primaries, and at the anal angle of secondaries. Transverse lines of primaries composed of the light ground color, edged by the overlaying brown scales. All extend out from costa to a little less than one third across the wing, then bend sharply inward and run irregularly and obliquely to inner margin. Basal line single, edged internally on costa by deep brown. Intradiscal line one third out from base, geminate, edged externally before angle by a conspicuous brown mark which unites with the linear discal spot. Median line geminate, passing just outside the discal spot. Extradiscal line begins one third in from apex and is the broadest and best defined line on the wing. Subterminal line single, narrow, defined and sharply denticulated throughout its course. Terminal line brown, interrupted at the veins, the parts slightly drawn inward between the veins forming distinct triangles on the anterior half of the wing. Fringe gray, brown checkered on inner half. Secondaries with six transverse lines, evident on inner edge of wing, the outer two faintly traceable to the costa running parallel with the outer margin. Terminal line as in fore wings but the triangles not well marked. Discal spot brown, moderate in size, somewhat diffuse. Beneath, paler than above, evenly shaded with brown on costal region and outer area of primaries. The more conspicuous lines of the upper side are feebly reproduced. Discal spots prominent.

Type. — One male in my cabinet.

Habitat. — Minnehaha, Arizona, September 3 (Hudson).

This species bears a somewhat general appearance to *Eupithecia niveifascia* Hulst but the generic characters will serve to distinguish it from that species.

2. *Gymnocelis discoidalis*, new species.

Expanse, 16 mm. Head whitish becoming darker anteriorly till the apex of the conic front is dark brown; palpi brown, projecting a little beyond the front. Thorax whitish, peppered with black scales posteriorly; a black spot on the middle of each patagium. Abdomen whitish, sparsely scattered over with black scales; apex of segments black dorsally; black lateral marks forming a broken line. Ground color of both wings whitish. Basal, intradiscal and median lines of primaries barely indicated by a scattering of black scales, the two latter marked on the costa by a diffuse patch of black scales. Immediately outward of the median line is the extremely large, round, black, discal spot, one millimeter in diameter and very contrasting. Extradiscal line begins on costa in a black triangular patch of scales, extends outward to M_1 , bends rather evenly around to Cu_2 , then is once feebly

dentate to inner margin. Following this are two narrow lines running parallel with it, the outer one blending with the outer area. External to this are three blackish patches, the first on the costa, the second between M_1 and M_3 and the third near the anal angle. Subterminal line white, dentate, vaguely indicated, running outside the dark patches. Terminal line black, interrupted. Secondaries with two broad, zigzag blackish lines crossing the wing outside the discal spot; these are best marked on the lower two thirds of the wing. Between them is an ill-defined, narrow line. Basal part of inner edge with scattered black scales which tends to form a patch and an intradiscal line. Subterminal line white, bordering the outer edge of the second of the broad black lines. Terminal line as in fore wings. Discal spot round and moderate in size. Beneath, both wings whitish, the basal half of primaries shaded with gray. The black lines of above are clearly reproduced and the discal spots are large and of one size on both wings — smaller than that above on primaries, larger than that on secondaries above.

Type. — One female in Academy of Natural Sciences, Philadelphia.

Habitat. — Carr Canyon, Huachuca Mts., Cochise Co., Arizona, in August (Dr. Skinner).

Easily recognizable by the extremely large discal spot of primaries on a whitish background.

3. *Gymnocelis artestata*, new species.

Expanse, 18 mm. In the ornamentation of the primaries this species is very like *Eupithecia huachuca* described below. The extradiscal line is more angular near the costa than in that species and decidedly more denticulate below this angle but seems otherwise the same. The secondaries are very different from those of *huachuca*. A narrow brown line begins on the costa a little beyond the center and extends outward in a straight line to vein M_2 , then bends, rather sharply, and runs parallel with outer margin for a short distance and bending again runs to middle of inner margin. On the inner edge within this line three cross lines are indicated but these extend but a short distance into the wing. Beyond the line a vaguely marked, denticulate, subterminal brown line runs completely across the wing almost parallel to the outer margin. Outwardly it is edged with dirty white. Terminal line dark brown, even, broken at the veins. Discal spots linear, prominent. Beneath, the lines on the primaries are quite plainly reproduced on the outer portion of the wing. Secondaries whitish, the intradiscal and rectangular extradiscal lines prominent and completely crossing the wing. Two fainter lines between them are indicated on the costa and inner margins, but almost or quite disappear before reaching the discal spot. Subterminal line indicated by brown dots on the veins. Terminal line as above but fainter. Discal spots present on both wings, dark brown, linear.

Type. — One female in Academy Natural Sciences, Philadelphia.

Habitat. — Carr Canyon, Huachuca Mts., Cochise Co., Arizona, in August (Dr. Skinner).

Easily recognized by the peculiar course of the extradiscal line on the secondaries.

NOTE ON THE GENUS *Gymnocelis*, Mab.

The genus *Gymnocelis* as defined by Dr. Hulst is distinguished from *Eupithecia* (= *Tephroclystia*) chiefly by the absence of the upper pair of spurs on the hind tibiæ, but also by the possession of a conic tuft of scales on the front. The invalidity of this genus suggested itself to me at the time I attempted to place generically the species I described as *Gymnocelis remorata*. Nine of the eleven females of that species then in hand each possessed a minute pair of upper spurs as well as the fully developed terminal ones. This discovery led to an examination of all the specimens of *Gymnocelis* accessible to me, which fortunately included types of three of the four described species, and a representative of the fourth. The result was as follows :

G. desperata Hulst. The male type had two pair of spurs, the upper pair minute.

G. minuta Hulst. The two male types had each but a single pair of spurs. A third example in my own collection agreed with this.

G. inferior Hulst. The single type was in poor condition, being covered with shreds of fungi, and neither of the hind legs were present.

G. gypsata Grote. The single male examined had two pair of spurs, the upper pair very small.

G. remorata Gross. Seven males and two females had one pair of spurs ; nine females had two pair, the upper ones rudimentary.

Thus it appeared, that as far as this character was concerned the genus must fall in with *Eupithecia*. The next character, the conic frontal tuft, was then examined and it was found that *gypsata* and *desperata* had it well developed, as did also *remorata* ; in *minuta*, however, the only species that agreed with Hulst's generic diagnosis in that it had but a single pairs of spurs, the front was not protuberant in the least ! Much could not be seen of this structure in *inferior*, but it appeared to be undeveloped. It seemed, therefore, inevitable that the genus must fall, but before casting it into synonymy I examined some two hundred specimens of the genus *Eupithecia* representing upwards of fifty species. The result was that the peculiar tuft was found well developed in only one species, *E. raveocostulata* Pack., and to a lesser extent in *zygadeniata*, *longidens*, *edna* and a few others, and that the spurs were full-sized or nearly so in every species examined. So, while it appears that the frontal tuft can hardly be used as a generic character in this case, the material reduction in size of the upper posterior tibial spurs or their total absence might be, and I have

taken this view in describing the above species, especially in view of what Mr. L. B. Prout has said concerning the larva of the European species and type of the genus in a recent number of the "Entomologist."

All of the three species named above have the second minute pair of spurs referred to.

4. *Eupithecia huachuca*, new species.

Expanse, ♂ 15 mm., ♀ 16.5 mm. Palpi and inferior portion of front dark brown; remainder of front, vertex, thorax and abdomen fuscous-gray. Palpi slender from above, projecting half the length of the head beyond the front. Thorax and abdomen mottled with brown and some ochreous tinged scales. Color of wings gray overlaid with dark fuscous scales, the transverse lines of the ground color appearing as whitish lines on a darker background. Primaries with basal line single, evenly curved and edged internally with brown. Intradiscal line geminate, with two large outward denticulations before reaching inner margin. Median line geminate, rounding the discal spot outwardly and subparallel to intradiscal line. The area between the two lines dark shaded on the costa. Extradiscal line also double, begins on costa one third in from apex, extends outward to M_1 , then bends rather roundly inward and runs to inner margin, being twice denticulate just before reaching that edge. In the male these denticulations are hardly indicated but are plainly shown in the female. Internally the extradiscal line is edged with blackish, conspicuously so on the costal third. Externally it is followed by a dark band which extends to the subterminal line and is centrally traversed by an indefinite whitish line. Subterminal line white, zigzag at costa, regularly scalloped below this, the preceding dark band filling the resultant acute angles. Terminal space gray or dark brownish. Terminal line black, interrupted at veins. Discal spot oval, conspicuous. Fringe faintly checkered. Secondaries darker toward inner margin, with four curved and slightly waved cross lines, one intradiscal and three extradiscal, the inner of these latter three close to the small discal spot. All of these lines are plainly indicated on the inner edge and are only with difficulty traced across the wing. Subterminal line white, zigzag. Terminal line brown, distinct, interrupted. Fringe checkered. Beneath, primaries suffused with fuscous on basal area and especially near costa, the median, extradiscal and subterminal lines broader than above, the space between them dark brown and appearing as the true lines of the under side. Secondaries divided in halves by the brown shade line within which the wing is darker than outside it. Subterminal line indicated by the dark shade line that precedes it. Terminal line conspicuous. Discal spots present on all wings.

Types. — Male in the collection of the author, female in the Academy of Natural Sciences, Philadelphia. Taken by Dr. Henry Skinner. Other specimens received from the same source after the above was written have been made co-types: they do not differ in the least from the types.

Habitat. — Carr Canyon, Huachuca Mts., Cochise Co., Arizona, August.

Nearest to *E. misturata* Hulst ; differing chiefly in the course the transverse lines assume after leaving the costa ; in *misturata* they go outward rather than downward as in *huachuca*.

5. *Eupithecia pretansata*, new species.

Expanse, 20 mm. Head, thorax and abdomen grayish-brown mottled with darker brown, the latter with a narrow black cross band posteriorly on the first segment ; palpi moderate in length ; antennæ finely ciliated, annulated with gray and dark brown. Primaries dark brown over a gray background and crossed by a number of subparallel, poorly marked lines. Basal line brown, begins on costa a short distance out from root of wing and extends irregularly to inner margin ending far in at the base of the wing. This is followed by a band of gray and then come three narrow brown lines, best marked on lower part of wing, enclosing two broader gray lines. The extradiscal line begins on costa less than two thirds out from base, extends outward to vein R_5 , then obliquely inward to inner margin being twice feebly dentate. Two other poorly defined brown lines follow and a geminate grayish line is formed between them. The central area of the wing is darker than the two bounding ones and a dark brown median line is vaguely indicated running through the middle and passing the discal spot internally. Subterminal line whitish, dentate. Terminal line fine, brown, interrupted. Discal spot black, linear. Secondaries grayish with fine brown lines beginning on the inner edge and running evenly inwardly, but all except the fourth from the base disappear before reaching the middle of the wing. The fourth extends almost to the costa and is slightly waved. Terminal line as in fore wings. Discal spot brown, longer than broad. Beneath, primaries gray, extradiscal line showing as a geminate white line ; other lines scarcely evident. Secondaries whitish-gray, intradiscal, median and extradiscal lines rather well marked, the first two scarcely reaching the costa, the last curved quite far inward before meeting costa. Discal spots on all wings, linear, dark brown.

Type. — One female in the collection of the Academy of Natural Sciences, Philadelphia.

Habitat. — Carr Canyon, Huachuca Mts., Cochise Co., Arizona, in August (Dr. Skinner).

6. *Eupithecia purpurissata*, new species.

Expanse, 20–22 mm. In wing form like the ordinary type of *Eupithecia*, — wings not unusually extended nor unusually broad. Front slightly protuberant, palpi extending a little beyond the front. Entire moth above including palpi, front, antennæ, etc., an even purplish-brown. Primaries without markings save a rather large, round, black discal spot and a terminal line indicated by a heightening in the ground color. Secondaries slightly paler toward base and showing a small discal dot and a terminal line as in fore wings. On the inner edge are faint indications of six transverse lines which extend only a short way into the wing. Beneath, all wings paler especially basally, and exceedingly faint indications of a geminate extradiscal and median lines are present on the primaries and several ill-defined, evenly rounded lines cross the secondaries. Discal spots small, scarcely discernible.

Types.—♂ in Rutgers College collection, ♀ in the author's collection; co-types in the Brooklyn Institute Museum.

Habitat.—Monterey Co., Cal.

7. ***Eupithecia emmedonia*, new species.**

Expanse, 17 mm. Palpi short, scarcely extending beyond the evenly rounded front, black with a few white scales. Head light gray, the lower part of front and space between the antennæ black. Thorax whitish. Abdomen brown with intermixed whitish scales. Ground color of wings almost white, the primaries rather long and narrow and with two contrasting blackish bands crossing the central portion of the wing besides the basal line. The first of these bands begins broadly on the costa just inward of the middle and extends to the cell, then becomes very broad and with an even sweep runs far inward, becoming narrower as it proceeds and ends on inner margin one fourth out from the base. The second is narrower, begins on costa as far in from apex as the first is out from the base and runs almost parallel with it to inner margin. Jet black scales are on the veins within these bands, and one on the first band is in the center of the cell. The basal line is black and extends irregularly from costa to inner margin. A narrow line vaguely indicated is present running along the outer side of the second band. External half of outer area shaded with blackish but broken with subapical dashes of ground color, and a white subterminal line runs rather evenly through it. Terminal line black. Fringe gray. Secondaries with two even bands continuous with those of fore wings but which almost disappear at costa. Anal angle shaded with black and showing the termination of the whitish, denticulate subterminal line, the remainder of which is lost in the pale ground color above the anal angle region. Terminal line blackish, best marked toward and at anal angle. Beneath, both wings light gray shaded with darker gray toward the base, the bands of upper side indicated by black spots on the veins.

Type.—One male in the Brooklyn Institute Museum received through Mr. Jacob Doll.

Habitat.—Monterey Co., Cal.

Readily distinguished from all described species by the white ground color across which two contrasting blackish lines extend.

8. ***Rheumaptera medeifascia*, new species.**

Expanse, 26–28 mm. Palpi pale luteous, tipped at apex with dark brown; vertex and front dark brown with intermixed luteous scales. Thorax variegated with white, luteous and brown scales. Abdomen pale ochrey with numerous intermixed brown scales and sometimes a pair of brown dorsal spots on the anterior segments. Ground color of wings sordid luteous. The basal and outer fields of primaries separated by a broad brown median fascia which begins broadly at center of the costal margin and becomes narrower as it proceeds across the wing to inner margin; the internal edge of this fascia is evenly curved from one margin to the other, the external edge is outcurved to center of wing, then faintly incurved and straight to inner margin. Basal area overlaid with brown, darker toward root of wings, paler outwardly. Basal line dark brown, double, irregular in its course and scarcely to be traced through this

dark portion of the wing; it is followed by a diffuse whitish band. Intradiscal line formed by the ground color, geminate, the outer line bordering the inner edge of the median fascia with which both are parallel. Inner portion of outer area occupied by a broad band of ground color which is sometimes traversed through its center by a pale brown line. Outer portion of area brownish, paler internally and somewhat broken into anteriorly by the ground color. A white line passes through the center from costa to internal angle. Terminal line deep brown, broken at the veins and in the center of the cells. Discal spot large, black, oval. Secondaries with the lines and shades of outer half of primaries faintly repeated from inner edge to center of wing. Terminal line as in fore wings but somewhat scalloped. Discal spot present, small. Beneath, pale luteous, the darker ornamentation of above reproduced in ochre. Discal spots small on all wings but distinct. Terminal line as above.

Types. — Two males from Mr. Frank Haimbach of Philadelphia, one of which he has kindly allowed me to retain.

Habitat. — Huachuca Mts., Arizona, in July (H. A. Koeber).

This species has the general aspect of a *Petrophora* and approaches *Hydriomena mirabilata* Grt. in style of markings, but is quite different from that species both in general color and in the course of the transverse lines.

9. *Cænocalpe delicata*, new species.

Expanse, 26–28 mm. Palpi brown; head brown with deep carmine scales, especially on the vertex; thorax, except the patagia which are brown with mixed carmine scales, and abdomen yellowish brown. Both wings pale translucent fuscous, considerably darker on costal and apical areas of primaries and washed over with a delicate pink hue, which in the darker portions shows as prominent carmine scales. Costa of primaries marked by four large, white, quadrangular spots, the third from the base lengthened longitudinally, the fourth continued in a broad line which crosses the wing, extending in an even outward curve almost to center of wing, then almost straight to inner margin. In this pale band the pink color shows up prominently below the costal area. There is a vague indication of an oval discal spot. Fringe brown, traversed by two fine pink lines. Secondaries evenly colored except at extreme outer edge where it is brownish. Beneath, the pattern on the primaries above is reproduced, the darker portions being still darker and more mixed with red while the white is a little obscured. Secondaries much darker than above and heavily suffused with reddish especially on outer half. There are two elongate, white marks, heavily edged outward with brown a little beyond the middle of the wing, one beginning on costa and extending in a straight line toward anal angle, the other commencing on inner edge and running toward the apex. These if continued would meet to form a single complete band, angled in the middle, but in none of the specimens before me are the marks connected. Discal spot small, linear.

Types. — Four males and five females in my own collection. Co-types will be placed in Rutgers College collection.

Habitat. — Stockton, Utah, Sept. 12 (Spalding).

This species is nearest to *Cenocalpe cænonymphata* Hulst which it closely resembles from above except that the cross line is not sharply angulated as in that species. Beneath, the markings on the secondaries are very different, the transverse band in *cænonymphata* being much nearer the base of the wing, continuous and rectangled and edged inwardly instead of outwardly with brown.

10. *Sciagraphia conarata*, new species.

Expanse, 13-15 mm. Body and wings above pale flesh color, the costa of primaries marked by small, slaty-brown flecks, and atoms of the same color are scattered over the outer area; the hind wings paler basally and have also a scattering of grayish atoms. Primaries crossed by three transverse lines slaty-brown in color on the costa, thence orange-pink to inner margin. The first of these begins over one fourth out from base, runs outward to cell, then curves inward and extends evenly to inner margin. The second begins almost at the center of the costa, runs outward to below the cell, then curves inward and outward again, ending near the middle of the inner margin; this line is a little wider and more diffuse than the others. The third begins on the costa one third in from apex, runs outward to M_1 , then twice sinuous to inner margin ending one third in from anal angle; this line is marked on veins M_1 to Cu_1 by a small black spot and sometimes two or more of these connect. A diffuse spot on the median line within the cell indicates a discal spot. Subterminal line an irregular whitish line running through the outer area. Terminal line a series of intervenular dots. Fringe pale, somewhat checkered. Secondaries with a small brown spot on outer two thirds of inner margin marking the origin of a faint pinkish transverse line. Terminal line as in primaries. Discal spot moderate in size, not prominent. Beneath whitish, sprinkled with brownish atoms and with a broad brownish outer margin to both wings. Discal spots on all wings.

Types. — Three females in the writer's collection one of which will be placed in Rutgers College collection.

Habitat. — Yavapai Co., Arizona, May 22-29 (Hudson).

11. *Sciagraphia parcata*, new species.

Expanse, 23-25 mm. Head, body and wings dirty whitish with a faint yellowish cast; both wings with a sprinkling of brown scales. Primaries with three equidistant, incomplete, faint, brownish cross lines. Intradiscal line faint, outcurved, rather strongly so at discal cell, marked on costa and veins by a distinct brown spot. Median line vaguely indicated, most distinct from costa to cell and at inner margin. Extradiscal line almost continuous, extends outward from costa to M_1 where it forms an acute angle, thence proceeds gently sinuous across wing making a rather bold inward and outward curve just before reaching inner margin. The line is marked on the costa by a large brown spot and on veins M_1 to Cu_2 by smaller spots of the same color. Outer area with a large pale brownish blotch at costa midway between extradiscal line and apex, another in center of area bordering the same line and two fainter and equally large ones at outer margin. Subterminal line an indefinite whitish shade running between these four blotches — two on each side. Terminal line broken at the

veins and sometimes reduced to a series of dots. Discal spot not very distinct. Fringe checkered white and gray. Secondaries with a single submedian, irregular, brownish line, most distinct toward inner margin and marked by a brown spot on some of the veins. Terminal line and fringe as in fore wings. Discal spot brown, distinct. Beneath whitish on inner two thirds with a scattering of pale brownish scales. Extradiscal line repeated, followed by a narrow strip of ground color, the remainder of outer area pale brown with the blotches of above reproduced in it. Secondaries like primaries save that it is the submedian line that is reproduced. Discal spots on all wings prominent.

The above describes the female type more particularly; a co-type is much the same in markings but the cross lines are almost absent and are indicated by the brown spots by which the lines are marked.

Types. — Two females in the author's collection.

Habitat. — Yavapai Co., Arizona, May 23 and 29.

12. *Euemera angularia*, new species.

Expanse, 30 mm. In wing form differs from the described species of the genus in being obtusely angled on primaries at vein M_3 and acutely angled and extended on secondaries at the same vein. Head, thorax and abdomen pale creamy-yellow. Wings concolorous, the primaries shaded with ochreous outwardly and costally and both wings speckled with numerous brown transverse strigæ, especially heavy on outer half of secondaries. Fore wings crossed by a single rather broad brown line which is obscurely divided by a faint and somewhat broken line of gray scales; it begins on the costa one third in from apex, runs curvedly outward a short distance and forming an acute angle extends to inner margin in a series of slight irregular, inward scallops ending one third in from the anal angle. Discal spot small, brown, linear. Fringe brown. Hind wings also crossed completely by a single line corresponding to that on the fore wings. It is a pale brown, extends across the wing a little outward of the middle and is irregular throughout its course, being as a whole straight except for the curve from costa. A little below this line a still paler shade line departs from it and thence diverging runs to the inner margin. Discal spot absent. Fringes as in primaries. Beneath, paler, the brown strigæ consequently showing up more prominently. Strigæ entirely absent from inner areas. The lines of the upper side are quite strongly reflected, that on the fore wings broadening at the costa. Discal spot present on fore wings; absent on hind wings.

Type. — One fine male in the Academy of Natural Sciences, Philadelphia.

Habitat. — Carr Canyon, Huachuca Mts., Cochise Co., Arizona, in August (Dr. Skinner).

Differs decidedly from its congeners by the angulated wings and by the transverse line of primaries being bent inwardly near the costa instead of at the center of the wing.

13. *Phengommatæa spoliata*, new species.

Expanse, 34-38 mm. Head, thorax, abdomen and fore wings of male dark buff, the head somewhat lighter than the rest; hind wings much paler outwardly, shaded

with pale buff. Head and body of female pale straw yellow, hind wings concolorous, fore wings darker. Two broad purplish brown lines cross the primaries, the outer or extradiscal edged externally with pale yellow. Intradiscal line broad, somewhat diffuse throughout, begins on costa over one third out from base and is evenly outcurved to inner margin ending a little farther in on that margin than on costa. A discal spot is barely indicated by a heightening in the ground color. Extradiscal line begins on costa a little way in from apex as a narrow line and extends wavyly inwardly, becoming wider as it proceeds, to M_2 , then forms an outward rectangle and continues obliquely inward, turning out again before reaching inner margin. On secondaries a single broad line concolorous with those on primaries but faint and diffuse begins on the inner edge a little below the middle and extends inwardly curved to center of wing, here it fades out in the male but can be traced as an outward and then inward curve to costa in the female. Beneath, both sexes are uniformly pale creamy yellow on all wings.

Types. — Male in Brooklyn Institute Museum (J. Doll) ; female in the author's collection.

Habitat. — Monterey Co., Cal.

This handsome species differs decidedly from *P. edwardsata* Hulst in the course of the intradiscal line. In *edwardsata* this begins at the center of the costa and extends far out toward the outer margin of the wing, then turns inward and runs sinuously to inner margin. In *spoliata* this line does not begin out so far on the costa and is evenly curved throughout. The extradiscal line is approximately the same in both.

14. *Alcis addendaria*, new species.

Expanse, 34–36 mm. Head, thorax and body gray ; front, palpi and apex of abdominal segments black. Ground color of wings light, whitish-gray in the male darker in the female. Basal line not apparent. Intradiscal line present on costa one third out from base as a black oblong mark directed toward anal angle, through the discal cell it is obsolete or only vaguely indicated, is marked on the cubital vein by a single spot, again fades out for a short distance and reappears very strongly near the anal vein and sweeps far in on the inner margin. In some specimens this line is internally edged with a diffuse shade of brown separated from it by a line of the ground color. Extradiscal line begins on costa less than one third in from apex and is represented by a series of black venular spots which are more or less connected by a diffuse line. Together they form a denticulate line, the spots at the apices of the denticulations. From the costa it extends downward and roundly outward, then sweeps far inward ending at the center of the inner margin. Inward of this line on the inner edge the median line is indicated and occasionally a remnant of this is present running through the diffuse patch of brown scales which represents the discal spot. Outward of the extradiscal line and separated from it by a line of ground color is a more or less defined broad, brown band. This is followed by a narrower band of ground color and the remainder of the area is darker again and traversed through its center by a denticulate, white line. Terminal line brown, evenly, outwardly scal-

loped. Fringes checkered brown and white. Secondaries with only one prominent brown line crossing the wing outward of the linear discal spot. This is curved gently inward and outward before reaching the inner margin and is marked heavily on the veins. Outward of this line are the same brown shade bands with white denticulate line and terminal scalloped brown line arranged as described for the primaries. Beneath, both wings are almost uniformly whitish-gray, somewhat brownish on the costa and subapical portions of primaries. A large, oval, brown discal spot on fore wings, but that on hind wings scarcely indicated.

Types. — Eight males and one female in the author's collection. Co-types will be placed in Rutgers College collection.

Habitat. — Stockton, Utah, July 2-14, 1907.

15. *Selidosema anastomosaria*, new species.

Expanse, 31.5-35 mm. Head white with a blackish cross band between the bases of the antennæ and another across the middle of the front. Thorax white with a few black scales; collar blackish. Abdomen banded black and whitish. Ground color of wings whitish shaded with pale, dirty ochereous and sprinkled over rather sparsely with brown atoms. Primaries with three prominent, brownish-black transverse lines, the intradiscal, median and extradiscal. Basal line indicated on costa by a distinct mark of the same color. Intradiscal line begins one third out from base on costa, extends broadly outward to edge of cell, bends inward at right angles and is thence somewhat scalloped to inner margin, the last scallop projecting quite far outward. Median line more diffuse, begins from a large, squarish patch at middle of costa, extends through discal spot and then runs obliquely inward taking an irregular course and almost meeting the projecting scallop of the preceding line. Extradiscal line originates on costa as far out from median line as the intradiscal line is inward of it and in general extends roundly outward, then sweeps inward anastomosing with median line between the cubitus and anal veins, and then runs shortly outward to inner margin; between the veins it is inwardly scalloped, those in the central portion being less strongly curved, and the angles extend in black points outward along the veins. Externally of this line a broad band of the ochereous ground color runs parallel with it. Subterminal line white, strongly dentate, subparallel to outer margin; internally of it a large patch of brown scales appears between veins M_1 to M_3 and sometimes another equally as large at the costa. Terminal line blackish, evenly scalloped around the veins. Fringe gray divided by a brown line. Secondaries with two brownish-black lines in the central portion of wing which begin on inner margin and extend strongly over two thirds of the wing but are lost before reaching the costa. The first is inward of the discal spot and rather even in its course; the second is somewhat irregular, runs toward the discal spot to M_1 , then curves outwardly around it. Subterminal line white, broad and wavy; between it and the extradiscal line a band of the white ground color is plainly marked. Terminal line sharply indicated, scalloped as on fore wings though not so evenly. Fringe as in fore wings. Discal spot rather large, linear solid. Beneath, even grayish-white, sometimes with a subapical brown cloud, speckled with faint brown atoms and marked along the costa of primaries by brown flecks. Terminal line distinct; discal spots present on all wings.

Types. — One male in the Brooklyn Institute Museum ; co-types, two males in the Academy of Natural Sciences, Philadelphia and in my own collection.

Habitat. — Palmerlee, Cochise Co., Ariz., July (Doll) ; Carr Canyon, Huachuca Mts., Cochise Co., August (Skinner).

This a very distinct and contrastingly marked species, not easily confounded with anything I know. It may be readily recognized by the three black lines on the primaries widely separated and equidistant to each other on the costa but touching or almost so just above the inner margin. It is recorded as *Selidosema polygrammaria* Pack. in Science Bulletin, Vol. I, p. 208, but as far as I know that species has only been taken in the North Atlantic States.

16. *Stergamatæa dolliata*, new species.

Expanse, ♂ 38, ♀ 42 mm. Head, thorax, abdomen and ground color of wings dark flesh color with a brownish cast, the latter sprinkled over with dark scales, especially in outer areas. Palpi upturned, end member small, knob-like. Outer margin of fore wings almost even in male, but angled at vein M_3 in female. Primaries with an intradiscal somewhat broken and diffuse brownish band crossing the wing a little less than one third out from base, best marked on the costa and near the inner margin. Median shade quite broad, formed by a heightening in the ground color and crossing the wing a little outwardly of the discal spot. Extradiscal line an incomplete blackish-brown band beginning on costa less than one third in from apex and extending curvedly outward to middle of wing then inwardly curved to inner margin, appearing as large irregular blotches on costa, between veins M_2 and M_3 and between Cu_2 and inner margin ; between these blotches on veins M_1 and Cu_1 are smaller spots, each with a whitish center, and through the middle of the larger blotches a whitish, denticulate line passes. Subterminal line brownish-black, incomplete, denticulate, best marked opposite the large blotches of the extradiscal band. Terminal lost in the sprinkling of dark scales over this region of the wing. Fringe concolorous with ground color. Discal spot black, rounded, distinct. Secondaries with median shade, and extradiscal and subterminal lines continuous with those of primaries and also incomplete, the extradiscal line marked on the four median veins by brown spots with whitish centers, the subterminal line nearer complete and more diffuse. Terminal line indistinctly evident on lower part of outer margin as a brownish, scalloped line. Discal spot distinct. Beneath, pale even flesh color, marked on the costa of primaries with brownish at the origin of the transverse lines of above, and with a broad, brownish, submarginal cross-band on both wings sharply denticulate outwardly but blending abruptly with the ground color inwardly. Discal spots present, small.

The above describes more particularly the male : the female is less sharply marked and the whitish line passing through the large blotches forming the extradiscal line is scarcely evident.

Types. — One male and one female in the Brooklyn Institute Museum.

Habitat. — Palmerlee, Cochise Co., Ariz., in June.

Differs from *S. inornata* Hulst in the color of the background which in that species is pale yellow, and in the cross lines being broad and incomplete, not fine and continuous. It has been erroneously recorded in Science Bulletin, Vol. I, p. 209, as *Stergamataea inornata*. The species is named after Mr. Jacob Doll, who collected the specimens.

A male in good condition from Wilgus, Cochise Co., Ariz., is in the U. S. National Museum and has been made co-type.

17. *Gonodontis ectrapelaria*, new species.†

Expanse, 38-45 mm. Entire moth from above dark fuscous gray, the wings and abdomen sprinkled over with numerous black scales, the space between the antennæ sometimes light gray to almost white. Two lines cross the primaries, the intra- and extradiscal, both of them rather broad, black and prominent. The first begins on costa one fourth out from base and curves far out toward center of wing, then curves inward to inner margin. The second begins on costa less than one fourth in from apex and after running toward outer margin for a short distance bends inward and extends slightly sinuous to inner margin, the last outward curve quite decided before meeting the edge. The outer area is traversed by a heavy, irregular, black shading, the inner edge of which is diffused, the outer edge defined. Outward of this shade line the ground color of wing is a little lighter than the rest. Outer margin faintly and evenly scalloped. Fringe brownish. Secondaries with a broad, almost straight, slightly diffuse, black line through its center which extends sometimes completely across the wing and sometimes becomes obsolete on the costal region. A broad shade line in the outer area continuous with that of primaries but much fainter. Outer margin and fringe as in fore wings. Large black discal spots on both wings. Beneath, much paler than above, the transverse lines not indicated, but the outer shade lines strongly reproduced on both wings; discal spots present.

Types. — Male and female in the collection of the writer; co-type in Brooklyn Institute Museum and others will be placed in Rutgers College collection.

Habitat. — Stockton, Utah, July 2, August 9-26 (Spalding); Beaver Canyon, Utah, August (Doll).

Very different from all described American species. The two cross lines seem to be easily abraded and are then scarcely traceable on the dark ground color, but the outer shade and discal spots remain prominent.

NOTES ON ONCIDERES QUERCUS SKINNER.

BY G. BEYER,

NEW YORK CITY.

In 1905 I collected in the Huachuca Mountains, where I took *Oncideres quercus* Skinner. The beetle was not plentiful as I captured only 8 specimens during July and August. I was therefore surprised to see during the latter part of September the amount of work the insect had done and how many had been engaged in this work. *Oncideres* girdles an oak twig about half an inch in diameter at the base and fourteen to twenty-four inches long, gnaws the branch through to near its center, so that it has a very slight hold on the tree, then gnaws as many as six holes about three inches apart in the portion beyond the girdle and deposits an egg in each hole. The girdled twig soon dries up and the wind brings it to the ground. During September there were hundreds of these twigs to be seen all over the mountains. This proved that the beetle was very plentiful. The dry twigs also induce other beetles to make their breeding place in them. I took some of the infested twigs home and awaited results. In 1906 the little Scolytid *Chramesus icoriæ* Lec., came out in great numbers and during the summer there were certainly two broods of this beetle. It seemed to me that there could not be much nourishment left in the twigs for the larval *Oncideres*, which require two years for their development, but, to my surprise, during 1907 about 100 specimens emerged, also 4 specimens of *Pogonoderus negundo* Schaeff., and one *Liopus* sp. nov. The development of the two latter species also required two years. Last October I examined some of the twigs and found quite a number of *Oncideres* larvæ in good condition. This shows that the beetle can stay over even another year if circumstances are unfavorable. I expect to have another crop of this insect this year. How little nourishment the larvæ need is shown by the fact that a single twig half an inch in diameter at the base and twenty inches long contained 80 specimens of *Chramesus icoriæ* and 5 specimens of *Oncideres quercus*.

NOTES ON COCCINELLIDÆ.—III.

BY CHARLES W. LENG,

NEW YORK CITY.

(PLATE I.)

In the preparation of the following notes, the material in the National Museum, loaned through the favor of Dr. L. O. Howard, has been of the greatest assistance. The fine collections of Prof. H. F. Wickham and Mr. Charles Schaeffer have also supplied series which have been helpful; and examples of several species have been received from Messrs. Blanchard, Fall and Nunnenmacher. I am glad to express my thanks to all these friends for their kindness.

The drawing of the underside of *Anatis 15-punctata* in Vol. XI, December number, was made by Mr. Louis H. Joutel and should have been credited to him in the explanation of the plate.

Tribe III. CHILOCORINI.

Body very convex, rounded in outline; legs short, femora not extending beyond sides of body; antennæ very short, club with four connate joints; base of antennæ concealed by the broadly dilated epistoma; epipleuræ wide, concave, strongly descending externally; front coxal cavities closed, middle coxæ widely separated; head deeply inserted, pronotum covering part of the eyes; surface glabrous above, finely pubescent beneath; tarsi beneath densely spongy pubescent; abdomen with five segments ♀, six in the ♂, the sixth being very small.

The insects included in this tribe strongly resemble the Coccinellini but they are sharply defined by the form of the epistoma, which is dilated on each side so as completely to margin the eyes in front and conceal the antennæ.

The males can always be distinguished by the presence of the small sixth abdominal segment; the fifth segment also differs in form from that of the females, being either truncate, broadly emarginate or even quite deeply emarginate. In many species the males also differ by the paler color of the head, of the front angles of the thorax and of the legs; but in other species the sexes are alike in color.

Four genera have been proposed, but in these notes one is treated as a subgenus because the characters used for its separation become evanescent in some of the species now known. Three genera may be separated as follows:

Large species ; body very convex, subcompressed above, excavated beneath for the femora ; tibiæ not dentate ; claws strongly toothed, almost bifid.....*Axion*.
 Smaller species ; body as in *Axion* ; tibiæ dentate ; claws strongly toothed.

Chilocorus.

Still smaller ; body convex above, not excavated beneath ; tibiæ not dentate ; claws variable.....*Exochomus*.

Exochomus may be divided into three subgenera as follows :

Body more convex, almost subcompressed ; front tibiæ dilated in front into a keel ; claws strongly toothed.....subgen. *Arawana*.

Body simply convex ; front tibiæ simple ; claws strongly toothed except in the species *fasciatus*.....subgen. *Exochomus*.

Body convex ; front tibiæ simple ; claws at most feebly toothed and absolutely simple in *septentrionis*subgen. *Brumus*.

The type of the subgenus *Arawana* is the insect described by Casey as *Exochomus arizonicus*.

Axion Muls.

Very convex, subcompressed insects with smooth, almost impunctate elytra, black with red spots in our species. Pronotum feebly punctate near the side margins which are not pubescent, apical angles more or less pale. The males have the fifth segment emarginate, and a minute sixth segment, and the legs are paler than the females. In some species part of the head also is pale.

SYNOPSIS OF SPECIES.

Abdomen red.....1

Abdomen in great part black.....2

1. Elytra each with one large red spot.....*pilatei*.

Elytra each with a basal red spot and a small common sutural spot behind the middle ; epipleuræ thicker.....*tripustulatum*.

2. Elytra each with one large red spot.....*plagiatum*.

Axion pilatei Muls.

Broadly oval, very convex, elytra explanate. Black above except for a large red subbasal spot on the elytra. Red beneath except legs and middle of each abdominal segment black. First segment of abdomen and epipleuræ concave for the reception of the legs. Anterior angles of thorax nubilously pale. Epistoma almost encircling the eyes in front and fringed with hair. Glabrous above. Claws strongly toothed. Punctuation of upper surface so fine as to be almost invisible without microscopic examination ; under the microscope finely confluent punctulate with distant larger shallow punctures, the latter more evident on the pronotum and especially at its sides. Beneath more evidently punctured and pubescent especially on the abdomen and legs. Tarsi beneath densely spongy pubescent. Legs strongly contractile. Ventral plate incomplete, not reaching the margin of the segment.

In the male, the usual minute sixth ventral segment is present. The head in

front is yellow, the anterior margin and apical angles of the thorax are also yellow and the legs are quite pale in color.

Length. — 6.5–7.0 mm. = .26 to .28 inch.

Habitat. — Texas. Crotch gives also N. Mex. and Cal., but on account of some confusion having existed in collections in the identification of this species I consider these localities doubtful.

In some collections *Coccinella plagiata* is placed erroneously under this name. It is less convex, the head is entirely pale and the front of the pronotum is pale. The epistoma does not encircle the eyes as in all Chilocorini.

Axion tripustulatum DeG.

Similar to the preceding in size, form and structural characters. The elytra each bear a red basal oblique elongate spot and a small red sutural spot behind the middle. Beneath the abdomen, the base of the epipleuræ and the sides of the body are red. The edge of the elytra is much thicker than in the other species of the genus, and the form of the coxal plates is different, as shown in the plate. In the males, the front of the head, the anterior angles of the thorax and a great part of the femora are red.

Length. — 6.5 mm. = .26 inch.

Habitat. — Texas, La., Fla., Ga., Va., Md., Pa., N. J. (Pine Barrens), occasionally washed up on seabeaches of Coney Island, N. Y., and R. I.

Mr. William T. Davis has observed this species at Lakehurst, in the Pine Barrens of N. J. and the following note is contributed by him.

"*Axion tripustulatum* hibernates and is to be collected at Lakehurst, N. J., early in the spring. In the summer and fall great numbers are often found on the post-oaks (*Quercus minor*) that have been attacked by the scale insect, *Kermes pubescens* Bogue. This scale was determined by Mr. Pergande of Washington, D.C. On July 23, 1904, this *Axion* was found to have just matured in most instances and the elytra were still quite soft. On the same day of July, 1906, the beetles were emerging from the pupæ, but seemed to be several days behind those of 1904 in their development. To illustrate the number that often occur on the post-oaks it may be stated that on July 30, 1905, on one little twig less than six inches long, there were nine pupa skins and many leaves sheltered two or three on their under surface."

Axion plagiatum Oliv.

Broadly oval, very convex, elytra explanate. Black above except for a large red subbasal spot on each elytron which (especially in the females) sometimes attains the base. Beneath black, base of epipleuræ and sides of body pale, abdomen entirely black. The legs are pale in the males as in the preceding species, but the head is entirely black in both sexes.

Length. — 5.5. to 7.0 mm. = .22 to .28 inch.

Habitat. — So. Cal., Ariz., N. Mex., Texas.

Covering a wide range of territory, this species is subject to varia-

tions in size, punctuation and development of the elytral spot which have caused the following varieties to be described :

Var. plagiatum.

Larger (6 mm. or over) ; surface shining ; elytral spot ♂ small, not attaining the base, ♀ very large, almost basal. Abundant to the south of our territory and occasionally to be found within our limits.

Var. texanum Lec.

Smaller and less shining, elytral spot as in the preceding.
The usual form in Texas, Arizona and New Mexico.

Var. alutaceum Casey.

Smaller (about 6 mm.), surface alutaceous ; elytral spot almost alike in both sexes, small, not attaining the base.
Occasional specimens that comply with the author's description can be selected from any part of our territory.

Var. pleurale Lec.

Smaller (about 6 mm.), surface shining ; elytral spot similar in both sexes, large and almost basal.
The usual form in southern California.

Chilocorus Leach.

Tibiæ obtusely dentate externally near the base ; pronotum pubescent towards the sides ; abdomen and epipleuræ concave for the femora ; claws toothed. Our species are all black above with one red spot on each elytron. The males can be distinguished only by the minute additional sixth abdominal segment.

SYNOPSIS OF SPECIES.

- Sterna in great part red, abdomen red.
Larger, elytral spot nubilous.....*tumidus*.
Smaller, elytral spot large, sharply defined,.....*cacti*.
Sterna black, abdomen red.
Elytral spot in front of middle, punctuation closer and deeper.....*bivulnerus*.
Elytral spot at the middle ; punctuation more shallow and distant, surface more shining.....*similis*.

The species described as *fraternus* Lec. and *orbis* Casey are included with *bivulnerus*, and *confusor* Casey is included with *cacti*.

The ventral plate in *Chilocorus* reaches the posterior edge of the first ventral segment and overlaps slightly the second ventral segment. The fifth ventral is not emarginate in the ♂ as in *Axion* but simply outlined as in the ♀. I have not been able to find any sexual characters in the color of the legs or head and the males can be separated only by the additional ventral segment.

***Chilocorus tumidus*, new species.**

Broadly oval, very convex, shining black above with an ill-defined red spot in front of the middle of each elytron; below the abdomen, mouth parts and part of the sterna are red, all other parts black. There are a few hairs at the sides of the pronotum and more on the head, otherwise the entire upper surface is glabrous. The head is closely and conspicuously punctate, the pronotum and elytra bear shallow distant punctures between which the surface is microscopically punctulate. Each elytron is tumid or swollen in the subhumeral region, rather more conspicuously than in other species of the genus. The eyes are entirely surrounded in front by the epistoma; the anterior tibiæ are strongly dentate; the claws are strongly toothed at base, short and stout; the tarsi entirely present a stouter appearance than usual.

Length. — 5.5 mm. = .22 inch.

Habitat. — Fortress Monroe, Va., April 19.

Described from two specimens in the National Museum.

A specimen in the collection of Professor Fall, Pasadena, Cal., labelled Va., appears to be the same. Professor Fall's specimen is piceous instead of black and the red spot is larger and more distinctly outlined.

***Chilocorus bivulnerus* Muls.**

Broadly oval, very convex, shining black above, with a rounded red spot on each elytron in front of the middle and sharply defined; abdomen red beneath, sterna black; sides of pronotum slightly pubescent, head pubescent, upper surface otherwise glabrous; punctuation close and deep over the whole upper surface. The eyes epistoma, claws, anterior tibiæ and ventral segments are as described in the preceding species.

Length. — 3.7 to 5 mm. = .15 to .20 inch.

Habitat. — Entire U. S. except southern California, extending into Manitoba and Vancouver.

***Var. orbus* Casey.**

Black, with bluish reflection; elytral spot larger, transversely oval. Replaces *bivulnerus* in southern California. Casey has retained the name *fraternus* Lee for the specimens from northern California, Oregon and Washington but the characters given are not constant and this name can only be regarded as a synonym.

Chilocorus bivulnerus is the most widely distributed and best known member of the tribe Chilcorini and wherever found is reported as feeding on scale insects. Mr. Edgar L. Dickerson, assistant to the State Entomologist of New Jersey, has described the abundance of these beetles on maples attacked by the soft cottony scale.

***Chilocorus similis* Rossi.**

To be distinguished without difficulty from *bivulnerus* by the smaller size, elytral spot at the middle instead of in front of the middle, surface more shining, punctuation more shallow and distant.

Length. — 3.9 to 4.8 mm. = .15 to .19 inch.

Habitat. — Introduced from China and now established in Georgia and possibly other southern states.

The pernicious San Jose scale² was accidentally introduced in California and has since spread over our country faster than its native natural enemies can keep it in check, to the great damage of our peach and other fruit trees. In the hope of finding an effective enemy that might also be introduced, the Department of Agriculture sent an agent to China whence the San Jose scale was believed to have come. There *Chilocerus similis* was found to be sufficiently numerous to keep the scale in check. A number were brought alive to Washington and a large number were successfully bred in captivity and distributed to Georgia and New Jersey. In the latter state the winters seem to have been too severe for this species; but in Georgia it appears to have become established and to have been of service in keeping the scale from spreading.

In the larval stage this species differs more from our native *Chilocorus* than in the imago.

Chilocorus cacti Linn.

Broadly oval, very convex, shining black above with a large red spot on each elytron; beneath the sterna are in great part red, abdomen red. Pronotum slightly pubescent at the sides, deeply impressed apically near the angles in the male, edge there rufescent. Tibiæ armed with a short spine. Claws strongly toothed at base.

Length. — 5 mm. = .20 inch.

Habitat. — Honduras, Cuba, Mexico, Texas, Porto Rico, Florida (Key West).

Var. confusor Casey

Smaller, narrower, pronotum not impressed in the male, edge not rufescent.

Length. — 4.5. = .18 inch.

Habitat. — Arizona, So. Cal.

The specimens usually found in our collections represent this variety.

Arawana, a new subgenus.

This subgenus has for its type the species described by Casey as *Exochomus arizonicus*. It has all the characters of the tribe *Chilocorini* and of the genus *Exochomus* but differs from the other species of that genus by its form, which is subcompressed, and by its front tibæ, which are expanded in front into a thin plate, lamina or keel.

Arawana arizonica Casey.

Broadly oval, very convex, subcompressed; black above, head and pronotum slightly rufescent at apical margin, elytra each with an elongate oval red spot on the median line, extending two fifths from base with its margin rather nubilous and with nubilously red margin; *beneath testaceous throughout*; anterior tibæ dilated and

arcuately sublunate externally; claws strongly toothed, almost bifid; minutely punctulate, more distinctly toward the margins of the elytra which are evenly declivous to the edge, with a very fine marginal bead.

Length. — 3.7 to 3.9 mm. = .15 to .16 inch.

Habitat. — Arizona.

Looks at first sight like a small *Axion* but the body beneath is not excavated as in that genus. Easily known by the uniform testaceous color beneath and by the peculiar dilation of the front tibiæ. I regret that I have not seen males and am unable to give the sexual characters.

Subgenus EXOCHOMUS Redt.

By the removal of *arizonicus* and of the species with comparatively simple claws this subgenus becomes mere compact. All the species are small, rounded and convex, though never subcompressed as in preceding species, with toothed claws, simple tibiæ and variously decorated elytra. The forms differing only in pattern or extent of elytral marking are here treated as varieties.

SYNOPSIS OF SPECIES.

Claws strongly toothed.

Males with front of head and front angles of thorax pale.....*marginipennis*.

Males with head and thorax entirely dark.....*californicus*.

Claws feebly toothed at base.

Males with front of head slightly pale; thorax entirely dark.....*fasciatus*.

The females of the first species usually have the front angles of the thorax nubilously pale.

Exochomus marginipennis LeC.

Broadly oval, convex; head and pronotum black in female or partly pale in male, elytra pale with black markings; glabrous above and shining. Beneath black except the epipleuræ and in the male part of the legs; claws strongly toothed at base; tibiæ simple, coxal plates of the first ventral segment complete, semicircular, distant from the edge of the segment. Males with fifth ventral segment truncate disclosing a small sixth segment.

Length. — 2.5 to 3.0 mm. = .10 to .12 inch.

Habitat. — South and west from New York; not known to occur in New England or Canada.

This species varies in elytral markings and the following varieties have been described:

Var. childreni Muls.

Elytra each with one subapical black spot, rarely missing.

Occurs in Fla., La., Tex., Mo., So. Cal.

Var. *latiusculus* Casey.

Elytra each with two black spots, sometimes distant, sometimes united at suture forming transverse bands.

Occurs in Fla., La., Tex., Mo.

Var. *marginipennis* LeC.

Elytral spots united so as to leave only scutellar spot, lateral margin and sometimes a postmedian sutural spot pale.

Occurs in N. Y., N. J., Pa., D. C., Va., Fla., Ala., Miss., Tenn., Mo.

In the collection of Mr. Charles Schaeffer there is a series of *marginipennis* collected near St. Louis, Mo., in which all the varieties are represented. Except that there is a tendency in the southern states to produce the paler forms, these varietal names scarcely represent more than cabinet varieties.

***Exochomus californicus* Casey.**

Similar to the preceding but the elytra are entirely black, except for an elongate humeral mark, and subapical dot red. The color is identical in both sexes. *Desertorum* Casey, differs only by the humeral mark being extended along the base of the elytra.

Length. — 2.8 to 3.8 mm. = .11 to .15 inch.

Occurs in Cal. and Nevada.

***Exochomus fasciatus* Casey.**

Similar to the preceding but differs in the form of the claws which are feebly toothed at base and in the color of the head in the male which is either entirely dark as in the female or at most partly pale in front. The elytral markings in the few specimens examined consist of two transverse black bands but they may prove to be as variable as in *marginipennis*. The plate shows the forms already observed. A larger series is needed to complete the description of this species.

Length. — 2.4 to 2.9 mm. = .10 to .12 inch.

Habitat. — Southern California.

? Var. *subrotundus* Casey.

Known to me only by Casey's description and a few specimens which seem intermediate between this and *fasciatus*. It appears to be a variety in which the black fasciæ expanding leave only an irregular lateral margin pale.

Casey's description is as follows :

"Elytra black on the disk; body in general more broadly rounded; punctures very minute and sparse; head and pronotum black, the apical angles of the latter nubilously paler; elytra black, with a broad pale margin extending, with its inner margin parallel, to nearly three fifths, there obliquely and abruptly narrowed and continued narrowly almost to the apical angles; body smaller and much more broadly rounded than in *marginipennis*, with less obvious punctuation."

Length. — 2.2 mm. = .09 inch.

Habitat. — El Paso, Texas.

It is unfortunate that no mention is made of the claws in this description, so that an examination of the type is necessary to determine whether the insect is actually an *Exochomus* or a *Brumus*.

Subgenus *Brumus* Weise.

The type of *Brumus* is *septrionis* Weise in which the claws are entirely simple. Weise himself has since included the species *æthiops* (formerly placed in *Exochomus*) in which the ♂ claws appear to me to be feebly toothed. We have already seen in *E. fasciatus* a tendency towards the disappearance of the tooth in *Exochomus* and we have in *Brumus orbiculatus* a form in which the claws while not toothed are swollen at base. On account of these forms making a gradual transition from the strongly toothed claw to the simple claw, I have treated *Brumus* as a subgenus, to include all the Chilacorini with simple tibiæ and claws without evident tooth at least in one sex.

SYNOPSIS OF SPECIES.

Claws feebly toothed in ♂, simple in ♀.

Entirely black in color.....*æthiops*

Claws feebly swollen at base.

Black above with red markings.....*orbiculatus*.

Claws entirely simple in both sexes.

Elytra orange-yellow with black markings*septrionis*.

Elytra black with humeral and subapical red marks.....*histrio*.

Brumus æthiops Bland.

Broadly oval, convex, elytra explanate; black above and beneath; tibiæ not dentate; claws of tarsi feebly toothed at base ♂, entirely simple ♀; surface shining, punctuation very minute and sparse. The males are distinguished only by the smaller size, fifth abdominal segment truncate and sixth minute additional segment.

Length. — 3 to 4 mm. = .12 to .16 inch.

Habitat. — Nebraska, Colo., Utah, N. Mex., Arizona.

This species is easily known by the entirely black color.

Brumus orbiculatus, new species.

Broadly oval, very convex; black above, basal margin of elytra, also lateral margin and a large subapical round spot narrowly connected with lateral margin, red; the subapical spot is outlined posteriorly by the black apex. Beneath piceous, the epipleuræ and sides of abdomen fuscous. Shining and glabrous above, microscopically punctulate except the head which is evidently punctulate. Beneath punctulate and slightly pubescent. Tibiæ simple, claws very feebly swollen at base, not toothed. Side margin of elytra explanate.

Length. — 4 mm. = .16 inch.

Habitat. — Tucson, Arizona, July.

This insect by the markings suggests *E. subrotundus* Casey, but the great difference in size and the peculiar form of the claws seem to indicate an undescribed species.

***Brumus septentrionis* Weise.**

Broadly oval, convex, elytra explanate, shining; body black above and beneath, elytra orange-yellow with very variable black markings. Tibiæ and claws entirely simple in both sexes. Punctuation minute and sparse. The male is to be distinguished only by the truncate fifth segment and additional sixth segment.

This species varies greatly in its markings as follows:

Var. *septentrionis* Weise.

Elytra yellow, each with narrow sutural black stripe connected with small apical black space and two small black discal dots. *Högei* is included as an absolute synonym.

Length. — 3.5 to 4.5 mm. = .14 to .18 inch.

Habitat. — Manitoba, Montana, Washington, Colorado, Utah, N. Mex., Ariz., El Paso, Texas.

Var. *nevadensis*, new variety.

Elytra yellow, each with broad black sutural stripe connected with broad black apical space. No discal black dots in the type but in specimens collected with it one or two small dots appear.

Length. — 2.5 to 4.0 mm. = .10 to .16 inch.

Habitat. — Reno, Nevada, collected by Professor Wickham, July 18.

This is the only form thus far known from the coniferous forests of the Sierra but it is possible that further collecting may disclose other interesting forms from that region.

Var. *ovoideus* Casey.

Elytra yellow with broad sutural black stripe connected with black apical space and two large discal black spots. The anterior spot is connected with the sutural stripe in front, while the posterior spot is connected with the black apical space. In some specimens these black markings become so extended as to leave only basal and lateral margin and subapical dot pale; the resulting form so closely resembles *E. californicus* in its markings as to require an examination of the claws for its identification.

Length. — 3.8 to 4.0 mm. = .15 to .16 inch.

Habitat. — Colorado, Arizona.

Var. *davisi*, new variety.

Elytra yellow with broad black sutural stripe connected with broad black apical space and two large black discal spots connected with the sutural stripe in the type but disconnected in other specimens which I associate with it. The spots appear to be all connected in the more northern specimens.

Length. — 4.0 to 5.0 mm. = .16 to .20 inch.

Habitat. — Lake Superior, Mich., Mass., N. J., Pa., D. C., Va., Ala.

This variety is abundant at Lakehurst, N. J., in the spring, being found on pines infested with plant lice. A few specimens survive until July. I take pleasure in dedicating this insect to my life-long friend, William T. Davis.

Brumus histrio Fall.

Black above and beneath except for the pale humeral parallel mark and subapical dot, it reproduces exactly the coloring of *E. californicus* from which it differs, however, by the simple claws, which make it a species of *Brumus*.

Length. — 3 mm. = .12 inch.

Habitat. — Southern California.

Note. — A few typographical errors in vol. XI, December number, should be corrected, viz.:

Page 200, line 10, for "var." read "C"
 " " " 15, " " " "C"
 " " " 31, " "C" " "var."
 " 207, " 5, " "S" " "A"
 " 211, " 40, strike out the words
 "showing metacoxal line on first ventral
 segment at A."

LIST OF SPECIES OF CHILOCORINI.

Axion Muls.	marginipennis LeC.
pilatei Muls.	var. childreni Muls. [con-
tripustulatum DeG.	striatus Muls.].
plagiatum Oliv.	var. latiusculus Casey.
var. texanum Lec.	californicus Casey [desertorum
var. alutaceum Casey.	Casey].
var. pleurale Lec.	fasciatus Casey.
Chilocorus Leach.	var. subrotundus Casey.
tumidus n. sp.	subgenus <i>Brumus</i> Weise.
cacti Linn.	æthiops Bland.
var. confusor Casey.	orbiculatus n. sp.
bivulnerus Muls. [fraternus Lec.].	septentrionis Weise [Hogeï
var. orbus Casey.	Gorh.].
similis Rossi.	var. nevadensis n. var.
Exochomus Redt.	var. ovoideus Casey.
subgenus <i>Arawana</i> n. subgen.	var. davisii n. var.
arizonicus Casey.	histrio Fall.
subgenus <i>Exochomus</i> Redt.	

EXPLANATION OF PLATE I.

FIG. 1. Front view of *Chilocorus*, showing the convex form and at A, the expanded epistoma, encircling the eyes in front.

FIG. 2. Front leg of *Chilocorus*, showing the tooth on the tibia.

FIG. 3. Front tibia of *Chilocorus* more enlarged.

FIG. 4. Abdomen of *Axion* ♂ showing emarginate fifth segment and additional sixth segment; also incomplete coxal plates on first segment.

FIG. 5. Abdomen of *Axion* ♀.

FIG. 6. Abdomen of *Chilocorus* ♂ showing overlapping coxal plates on first segment and truncate fifth segment.

FIG. 7. Coxal plates of *Axion tripustulatum*.

FIG. 8. Coxal plates of *Exochomus*.

FIG. 8A. Coxal plates of *Brumus*.

FIG. 9. Front tibia of *Arawana* showing the sublunate keel in front.

FIG. 10. Claw of *Axion*.

FIG. 11. Claw of *Chilocorus*.

FIG. 12. Claw of *Exochomus marginipennis*.

FIG. 13. Claw of *Exochomus fasciatus*.

FIG. 14. Claw of *Brumus orbiculatus*.

FIG. 15. Claw of *Brumus septentrionis*.

FIG. 16. Claw of *Brumus athiops* ♂.

FIG. 17. Elytral marking of *A. pilatei*.

FIG. 18. Elytral marking of *A. plagiatum* ♂.

FIG. 19. Elytral marking of *A. plagiatum* ♀.

FIG. 20. Elytral marking of *A. pleurale*.

FIG. 21. Elytral marking of *A. tripustulatum*.

FIG. 22. Elytral marking of *Arawana arizonica*.

FIG. 23. Elytral marking of *C. cacti*.

FIG. 24. Elytral marking of *C. bivulnerus*.

FIG. 25. Elytral marking of *C. tumidus*.

FIGS. 26 and 27. Elytral marking of *E. childreni*.

FIGS. 28, 29, 30 and 31. Elytral marking of *E. latiusculus*.

FIGS. 32, 33 and 34. Elytral marking of *E. marginipennis*.

FIGS. 35, 36 and 37. Elytral marking of *E. fasciatus*.

FIGS. 38 and 39. Elytral marking of *E. subrotundus*.

FIGS. 40 and 41. Elytral marking of *E. californicus*.

FIG. 42. Elytral marking of *B. septentrionis*.

FIGS. 43, 44 and 45. Elytral marking of *B. davisi*.

FIGS. 46, 47, 48 and 49. Elytral marking of *B. ovoideus*.

FIGS. 50, 51 and 52. Elytral marking of *B. nevadensis*.

FIG. 53. Elytral marking of *B. histrio*.

FIG. 54. Elytral marking of *B. orbiculatus*.

FIG. 55. Pale head marking of *A. pilatei*.

FIG. 56. Pale head marking of *A. tripustulatum*.

FIG. 57. Pale head marking of *E. marginipennis*.

The drawings are to be understood as diagrams indicating size, shape and markings to illustrate the text; and not as being accurate in every detail. The claws present the appearance shown in the drawings from one point of view only. They are like thin plates cut into form indicated and consequently appear quite simple when seen from the side.

A NEW CYNIPID FROM ARIZONA.

BY WILLIAM BEUTENMÜLLER,

NEW YORK CITY.

(PLATE II.)

Aulax chrysothamni, new species.

Male and Female. — Head rufous, vertex piceous in the female, wholly black in the male, very finely and minutely punctate. Antennæ rufous in the female, piceous in the male. Thorax black, very minutely and evenly punctate, subopaque; parasidal grooves obliterated anteriorly, very fine posteriorly and convergent at the scutellum. Anterior lines from the collar very indistinct and scarcely reaching the middle of the thorax. Median groove from the scutellum wanting. Pleuræ finely striate. Scutellum black, rugose, with two pit-like depressions at the base. Abdomen black in both sexes. Legs rufous. Wings hyaline, with dark brown veins. Length of male 1.50 mm.; of the female 2 to 2.50 mm.

Gall. — Polythalamous. White, densely covered with white felt-like substance. Elongated, rounded or club-shaped, enlargements of the terminal twigs of the branches of a species of *Chrysothamnus* (*Bigelovia*), measuring from 15 to 30 mm. in length and 12 to 20 mm. in diameter. Sometimes two or three galls are in a row on the same branch. Internally the gall is white and of a pithy substance.

Habitat. — Tucson, Arizona (Gneomar von Krockow).

IS MUTATION A FACTOR IN THE PRODUCTION
OF VESTIGIAL WINGS AMONG INSECTS?*

BY CHARLES T. BRUES,

MILWAUKEE, WIS.

The application by zoölogists of experimental methods to the investigation of the varied problems of evolution has become so general during the past few years, that entomologists have almost entirely neglected to search in any other way for facts bearing on the mutation theory of De Vries.

The wealth of insect species and the constancy of their specific characters render them more available for non-experimental work of this sort than probably any other group of living organisms.

It is with the hope of calling attention to this interesting field that I have been tempted to present the following scattered observations on

*A paper read at the meeting of the Entomological Society of America at Chicago, December 30, 1907.

several groups of insects in which we find a degeneration of the wings. All the higher groups of insects are normally winged, but there are here and there a few restricted groups which have developed genera or species that are partially, almost, or even completely apterous.

In a former paper (*The Structure and Significance of Vestigial Wings among Insects*, Biol. Bull., Vol. 4, pp. 179-190) I have presented very briefly some more general conclusions concerning insects with vestigial wings. The present one deals only with a few special cases which seem to have some bearing on the principles of natural selection and mutation as applied to the evolution of these organs.

The all-sufficiency of natural selection to explain the origin of all wingless insects was granted by Darwin, and has been accepted by later investigators with an occasional slight protest. Thus, in 1891 Casey (*Ann. N. Y. Acad. Sci.*, Vol. 6, p. 65) referring to the constancy of vestigial wings says:

“It seems extremely difficult to account for this constancy on the theory of natural selection, and, as it is impossible to doubt the ever-acting reality of the principle in question, we can only infer that rudimentary vestigial organs are not necessarily inordinately variable, and when comparatively constant, that the standard is maintained by the action of other laws less easily appreciated.”

That we cannot hope to explain all cases of this sort by natural selection alone, I am firmly convinced from the few groups that I have examined. This is especially true of many genera of partially wingless beetles where the wings are protected beneath a sheath composed of the fused and immovable elytra. Thus enclosed between the wing covers and the body they are entirely without influence either physiologically on the animal itself, or externally in relation to its environment. Yet, under these conditions, we find them to be remarkably constant specific characters although not at all uniform within the range of many of the genera.

Several of the cases to be noted in the sequel point very strongly toward the occurrence of mutations in the origin of vestigial wings, while others, so far as I can see, require the assumption of distinctly orthogenetic or determinate tendencies in the degeneration of these structures.

The coleopterous family Carabidæ furnishes numerous interesting cases of wing degeneration which are in strong contrast to the well-developed condition of the wings among the majority of the family.

One genus, *Pasimachus*, is particularly noticeable on account of its large species of peculiar form which are almost completely apterous. In nine North American species which I have been able to examine, the size and shape of the wings is remarkably constant (see fig. 1). In this respect all closely resemble *Pasimachus punctulatus* Hald., the wings of which are figured in a previous paper. They are from three to four and one half millimeters in length, or about one third the length of the elytron, with a distinctly broader basal and suddenly narrower apical portion. So far as my observations go, they are narrowest in *subsulcatus* Say and broadest in *strenuus* Lec.; *costifer* Lec. shows the most marked distinction between the narrower and broader parts. None have any trace of a venation except for a slight costal thickening basally. Thus throughout this entire genus the wings are extremely reduced in size, yet peculiarly constant.

This constancy of form in all the species would seem to indicate that the type of wing must have been acquired before the more recent origin of the present species from a common stock, and that it has been perpetuated without any change during the later differentiation of these species, unless we are willing to grant the presence of a determinate evolution which has brought all to the same form more or less independently.

The extensive genus *Calosoma* belonging to the same family exhibits an

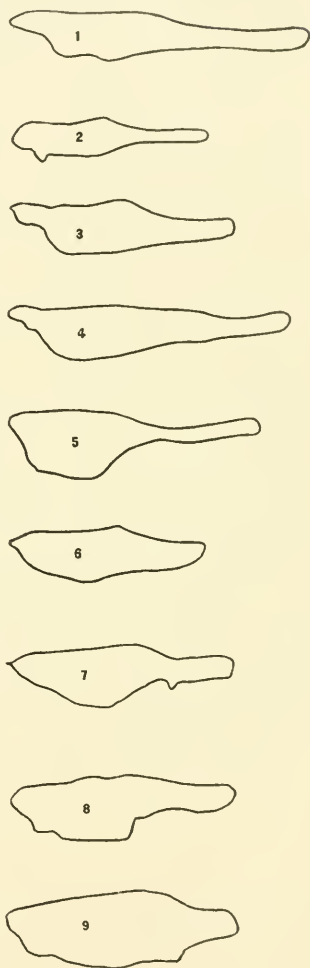


FIG. 1. Outlines of hind wings in nine species of *Pasimachus*. 1. *P. marginatus* Fabr.; 2. *P. subsulcatus* Say; 3. *P. elongatus* Lec.; 4. *P. duplicatus* Say; 5. *P. costifer* Lec.; 6. *P. sublævis* Beauv.; 7. *P. depressus* Fabr.; 8. *P. punctulatus* Hald.; 9. *P. strenuus* Lec.

entirely different condition from that prevailing in *Pasimachus*. It is very widely distributed and represented in temperate North America by about twenty-five species, some twenty of which I have had the opportunity to examine.

Of the entire number, seven (*C. haydeni* Horn, *C. subaneum* Chd., *C. moniliatum* Lec., *C. discors* Lec., *C. wilkesi* Lec., *C. luxatum* Say, and *C. latipenne* Horn) are practically apterous, their wing vestiges being hardly visible without the aid of a lens. The distribution of these ranges northwestward from Kansas, and the wingless forms reach their maximum development in the northern Pacific states. Nearly all (except *C. haydeni*, which I have not seen) form a well marked group definable on characters aside from winglessness, and in all, the elytra show the characteristic anchylosis which absolutely prevents the raising of the elytra above the body and thus precludes even an attempt at flight. In *C. palmeri* Horn, the wings are also short, and reach only about two thirds the length of the elytra, being only eight millimeters in length. This species, too, has the elytra anchylosed although it does not fall into the group containing the wingless species.

Aside from the subapterous forms, an interesting condition is to be seen among some members of the genus which are capable of flight. Two of our most common species in the eastern United States, *C. scrutator* Fabr. and *C. calidum* Fabr., show in the wings differences which are evidently adapted to their different habits. The former is diurnal, and to a great extent arboreal, ascending trees to obtain the caterpillars of which its food consists.

The latter species is terrestrial and nocturnal or crepuscular in feeding habits. This fact is sufficiently evidenced by the frequency with which it is found among the insects eaten by the common toad, while its ability to fly well on occasion is shown by the number attracted to electric street lights in cities on summer evenings. It shows a distinct correlation in its wings which are smaller and more delicate than those of *scrutator*.

In the case of *Calosoma scrutator* and its European congener *C. sycophanta*, the maintenance of strong wings is a necessity or at least a great advantage and comes well within the province of action of natural selection.

On the contrary, the origin of wing vestiges, like those of the various apterous species previously referred to, from a condition of

partial winglessness associated with elytral anchylosis can hardly be explained through the selection of slight variations, or in fact, by selection of any sort. With this single genus at least, we can scarcely imagine how the small wings can be either an advantage or a detriment in any way. It cannot be a matter of the conservation of moisture in the body as has been suggested in connection with certain desert inhabiting Tenebrionidæ, since these species of *Calosoma* seem to be associated indiscriminately with either xerophytic or mesophytic conditions.

Some other genera of Carabidæ contain wingless or subapterous species, but I have not been able to find any which present such continuity as the two just described, although others no doubt exist.

The Tenebrionid genus *Blapstinus* affords another interesting case of a small group of beetles which shows a great range of variation in wing development. It is represented in the United States by nearly fifty species, and reaches its highest development in the southwest. The beetles live in common with most members of the family concealed beneath stones or bark, some species confined to arid regions, others to the warm and moist regions of the Pacific and Gulf coasts, and some to the more temperate regions of the upper austral and transition zones.

The great variety of wing development among the species was first noted by Casey in 1890 (Ann. N. Y. Acad. Sci., Vol. 5, p. 416). He found that the wings vary in length from about one fifth to nearly six fifths of the elytral length, and that they are of almost constant shape and size for each species. Regarding their utility, he says: "In no case do they seem to be large enough, however, to give more than a labored and feeble flight."

In all species except those with the largest wings, the elytra are more or less perfectly anchylosed.

In a second paper published the following year Casey again refers to the constancy of these organs, as follows: "I have recently by way of experiment dissected a series of eight specimens of a form very near *Blapstinus rufipes*, probably a variety or race of that species, and have found a singular and altogether unexpected constancy in the form and size of the rudimentary hind wing, the extreme variation not amounting to more than one fifth of the average length, the latter being a little more than one half the total length of the elytra."

I have been able to examine the wings of a number of species and

have found that they agree with the measurements given by Casey, and to be very constant in the same species, so far as I can determine from the small series of each.

If these organs in *Blapstinus* are of no use for the primary function of flight, and are adapted to no secondary use, it would seem that we must look elsewhere than toward natural selection for the explanation of their origin and maintenance in so many and such constant degrees of degeneration among various species. As we have seen in the several groups previously discussed, this genus forms a very compact series separable only by minute specific differences which are apparently not or very slightly correlated with the variations in the wings.

The abundance of wingless beetles in arid regions has led me in this case to examine rather closely the geographical range and habitat of the various species so far as they have been recorded. I have been unable, however, to detect any positive connection between wing-length and environment with the exception of an apparent, but slight tendency toward smaller wings in desert or dry regions and longer ones in moist or cooler regions. Species with long, and others with very short wings often have overlapping or nearly coincident ranges in both humid and dry regions, but as has been found among other groups of Tenebrionidæ, the distinctly northern or northeastern species have the wings comparatively well developed.

That we have here another case not explainable by natural selection alone, I strongly suspect, while the acceptance of mutation will give at least a plausible explanation of the conditions as we find them.

The species belonging to the Hymenoptera are among the most active forms of insect life, yet we find two large and very many smaller groups where the wings of one sex are regularly absent or more or less atrophied. The more interesting cases from our present standpoint are to be found in the normally winged large groups where certain genera are regularly wingless.

In the Hymenoptera the wings whenever present, even as vestiges, are always entirely external, and never permanently concealed as among the Coleoptera heretofore considered, so that we must be extremely careful in assuming that they can ever be entirely without selective value. Nevertheless the occurrence in precisely similar environments of fully winged and partially or completely apterous species is not at all rare. A genus of small parasitic Hymenoptera, *Megaspilus*, is well represented in this country by a number of winged

species, several subapterous ones, and others entirely destitute of wings. In fact it seems probable that some of the normally volant species are occasionally only partly winged in both sexes. So far as primary function is concerned, a condition of slight reduction in the size of the wings is equivalent to their complete absence, since once below the standard required for flight, they are entirely useless, and hence cannot be of selective value, unless in respect to some secondary function which is extremely rare. Among related families other genera exhibit closely similar conditions, *e. g.*, *Caloteleia*, *Gryon*, *Hoplogryon* of the Scelionidæ; *Loxotropa* of the Diapriidæ, etc.

The occurrence of brachypterous forms of winged species has often been noted in widely separated groups of insects, but is usually the expression of seasonal or sexual dimorphism. At least in the Hymenoptera above referred to, the regular occurrence of these wingless forms without intermediate stages points in the same direction as the cases of wingless beetles, toward the existence of mutation as a factor, and a very prevalent one. It is interesting to note in this connection that Darwin himself mentions certain species of beetles that are normally winged, but which occasionally have vestigial wings.

So-called sports or mutations are not so rare in the wings of Hymenoptera which are completely winged, and there have recently come under my observation several very interesting cases. The first series of three abnormal specimens belong to the same species, *Myzine sex-cincta* Fabr., a member of the aculeate family Scoliidæ. The genus *Myzine* is notable for its strong sexual dimorphism that extends even to the venation of the wings which is very different in the sexes. This is a most remarkable character which is repeated in only a very few instances throughout the entire order with the exception of a few related Scoliid genera which are strongly dimorphic in this respect. In other groups the dimorphism usually affects only a single cell such as the radial.

All three abnormalities are in male specimens (selected from a series of not more than fifty) in which sex the venation also shows in any considerable series of specimens a strong tendency toward continuous variation in the length of certain veins, insertion of recurrent nervures, etc.

That this variation, both continuous and discontinuous is correlated with the sexual dimorphism and the great variability of the related genera seems very probable, and shows that the group as a

whole has an innate tendency toward continuous variation, and also toward variation which presents all the appearances of true mutation.

In one specimen the second section of the cubitus in the right wing is partly wanting; in another the third transverse cubitus is wanting; and in the third a part of both the recurrent nervure and the second transverse cubitus. Two closely related groups in this same family are generically separable by just such characters as those illustrated in the abnormal specimens, for example, *Elis*, *Trielis*, and *Tetrascolia* on the one hand and *Scolia* and *Discolia* on the other. No absolutely positive conclusions can be derived from such facts without experimental study, but the most logical one would seem to be the acceptance of these abnormalities as characters having the attributes of true mutations. That they are in no sense reversions is evident as the general evolutionary trend among Hymenoptera has always been toward reduction from the more complicated venational pattern of the more primitive groups.

A reduction of some sort is the form in which an abnormal character usually manifests itself in the wings of Hymenoptera, and it is very frequently almost perfectly bilateral.

The foregoing facts relating to wingless insects are perhaps no more striking than many others better known, and their principal interest lies in the bearing which they may have on the origin of fixed characters by mutation. I think also that it cannot be questioned that the evolution of these degenerating wings is in a certain sense determinate.

AUGUST LUETGENS.

August Luetgens died on January 21 in his seventy-first year. He was one of the original members of the Brooklyn Entomological Society and the owner of a large collection of Coleoptera in which the fauna of foreign countries was well represented. His collection was remarkable for the extreme care and skill with which the specimens were mounted and labelled. Each specimen was compared with the descriptions and remounted before being placed in the collection.

Mr. Luetgens was a German and a bachelor and had no relations in this country; he was employed as a bookkeeper for over thirty years by one firm; he lived for the same period with one family, and labored incessantly at the arrangement of his collection to which he devoted all his leisure time. He was of a retiring disposition and known to few entomologists in this country, but by them he was justly held in high esteem.

JOURNAL

OF THE

New York Entomological Society.

EDITED BY WILLIAM MORTON WHEELER.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MARCH 5, 1907.

Held at the American Museum of Natural History. Vice-President E. B. Southwick presided with twelve members and three visitors present.

Mr. Engelhardt related his collecting experiences on a trip made during the past summer along the St. Lawrence and Saguenay Rivers in Canada. He exhibited two boxes of insects and a number of photographs taken in the region. He spoke of his visit to Toronto, the Thousand Islands, Montreal, Ottawa, Quebec, the Saguenay River and Tadmsac. He spent two weeks at Tadmsac, a small fishing village, located at the junction of the Saguenay and St. Lawrence Rivers, where he did considerable insect collecting. This region is of especial interest as showing a great similarity to the sub-alpine region of the White Mts. of New Hampshire. Insects of all orders were found fairly abundant. On returning Mr. Engelhardt visited the White Mts. where, on top of Mt. Washington, he found aquatic insects very abundant in numerous small pools.

Mr. Schaeffer exhibited some Cicindelidæ which showed peculiar color variations. Among these were *C. oregona* var. *maricopa*, *C. purpurea*, obtained by Mr. Doll and Mr. Engelhardt in Utah, *C. perviridis* from California, and *C. obsoleta* from Arizona.

As Mr. Joutel was absent the reading of his paper was postponed but Mr. Southwick announced the title as, "The Mating Instinct Among Insects" and invited the members to discuss the subject.

Mr. Davis stated that while collecting at Newfoundland, N. J., he had cut from an ash log some immature longicorn beetles (*Bellemira scalaris*) which he placed in a bottle and during the night they copulated. They would not have been mature for two weeks at least.

Mr. Davis also related an account of the marriage flight of bumble-bees (*Bombus virginicus*) which he had been fortunate enough to observe.

Professor Wheeler related some interesting facts about the copulating habits of

some of the smaller Diptera. In one family (Dolichopodidæ) the typical males are remarkable in the character of the lengthened and narrow face as well as the modified fore legs and tarsi. The males in copulating clap these widened tarsi over the eyes of the females. Another family of Diptera (Empididæ) which live in the mountains and the northern woods, flying in swarms, execute a peculiar dance, which is different in the different species and may be represented diagrammatically.

Mr. Harris related how a number of years ago while living at Saratoga Springs, N. Y., where the winters were cold and the spring season late, he had put a freshly emerged female of *Promethia* moth on a *Syringa* bush some time early in May and in a short time found a male moth had been attracted by the female. It being much too early for these moths to hatch out of doors in that locality Mr. Harris could not account for its appearance.

Mr. Schaeffer spoke of an instance where a great many male *Promethia* moths had been attracted by placing the female cocoons outside. Mr. Dickerson mentioned a similar case of the attraction of male moths by the female cocoons.

Mr. Engelhardt told how one ingenious man had fed his ducks at Glendale, L. Is., by attracting swarms of male *Promethia* moths by imprisoning the female in a box on the ground.

Mr. Schaeffer told of seeing the male *Mutilla* in Arizona clasping the female and flying with her upon the bushes to copulate.

Mr. Dickerson stated that Dr. Raleigh had liberated marked male and female *Promethia* moths several miles apart in Chicago and that they found each other clear across the city.

Mr. Barker spoke of finding the nymphs of certain locusts *in coitu* quite common in southern Arizona. Mr. Engelhardt had seen the same thing in Utah.

Mr. Engelhardt and Mr. Doll while in Utah had exposed the female of a moth (*Myrithrus tibialis*) and attracted thereto one hundred and fifty males.

Professor Wheeler exhibited a small collection of ants which Mr. Schaeffer had collected in Brownsville, Texas, and southern Arizona. Though small the collection was of interest because it contained six species new to the United States and four species new to science.

Mr. Matausch exhibited some excellent pencil drawings of Membracidæ.

Mr. Beyer exhibited a collection of Cleridæ many of which were rare. He spoke briefly of their habits.

Mr. Zabriskie exhibited some Hymenoptera, the more important of which were *Pompilus atrox*, male and female, and *Pompilus* sp. with a large spider which it had killed and was dragging to its nest. To show an interesting phase of insect study he read an extract from "Wasps, Social and Solitary" by George and Elizabeth Peckham.

In connection with the extract read by Mr. Zabriskie, Mr. Schaeffer related an account of a combat which he witnessed in Texas between a tarantula and one of these large wasps.

MEETING OF MARCH 19, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair with eleven members and four visitors in attendance.

The librarian, Mr. Schaeffer, read a list of exchanges recently received as follows:

Horæ Societatis Entomologicæ Rossicæ, XXXVII, Nos. 3 and 4.

New Bruchidæ with Notes on Known Species. Chas. Schaeffer. Bull. Brooklyn Inst. Museum, I, No. 10.

Deutsche Entomolog. Zeitschrift, 1907, No. 1.

Mittheilungen d. Naturhist. Museums in Hamburg, XXXIII, No. 2.

Proc. Amer. Acad. Arts and Sciences, XLII, No. 19.

Wiener Entomol. Zeitung, XXVI, Nos. 1 and 2.

An Investigation of Evolution in Chrysomelid Beetles of the Genus Leptinotarsa.

W. L. Tower. Carnegie Institute, Washington, 1906.

Verhandlungen d. k. k. zool.-bot. Gesellschaft. Wien, LVI, No. 10.

Proc. Amer. Philos. Soc., XLV, No. 184.

Canadian Entomol., XXXIX, No. 3.

Acta Societatis Fauna et Flora Fennica, 1905, No. 25.

Middlebander Soc. p. Fauna et Flora Fennica, 1906.

Trans. of the Sapporo Nat. His. Soc., I, Pt. I, Sapporo, Japan.

Mr. Harris gave an account of a collecting trip to Knoxville, Tenn., and Ashville, N. C.

Mr. Schaeffer said that he had found the black form *Cicindela nigrata* on white beaches as well as further inland but it is much more common on Long Island than on New Jersey beaches. Mr. Harris stated that his experience had shown that *C. nigrata* is very local and he had found them on Long Island shore where there were no mud flats as at Far Rockaway.

Mr. Southwick asked if there was any resemblance between the Cicindelas and the kind of soil they frequented as seems to be the case with members of the genus *Salda* of the Hemiptera. Mr. Leng replied that such was not usually the case, although there were some exceptions as in *C. dorsalis* and *C. lepida*. Mr. Davis said that from their habits there was not so much need of protective coloration as there was for aggressive coloration.

Mr. William T. Davis exhibited eight species of galls the contents of which had been eaten by mice and birds. In the interesting and valuable article by Melville T. Cook on "Galls and Insects Producing Them" published in the Ohio Naturalist, the author states that "animals make but very little use of galls for food." In commenting upon this Mr. Davis remarked that galls like *Amphibolips confluentus* are often opened by birds, and such low growing galls as *Rhodites radicum* are attacked by mice with equal frequency. Also the egg bags of the large spider *Argiope* are opened by crows and mice, and the young spiders which hatch in the fall and hibernate in these bags during the winter are often devoured. Specimens of egg bags from Staten Island, opened by these animals, were exhibited.

Mr. Beyer exhibited a box containing practically all of the American members of the genus *Chrysomela*, stating that he had collected eleven species of this genus in the Huachuca Mts., Arizona.

Mr. Bischoff showed a box containing several hundred specimens of Coleoptera taken at Lakehurst, N. J., during three days early in July, 1906. Many good species were represented in the lot.

Mr. Zabriskie exhibited a large Chalcid parasite (*Leucospis affinis* Say) showing the peculiar position of the ovipositor lying in a groove along the back, instead of being placed ventrally as is usual among Hymenoptera. The male of this species

is very rare. This had been bred from galls on black locust infested by a moth (*Ecdytolopha insiticiana* Zell.).

MEETING OF APRIL 2, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair with sixteen members and six visitors present.

The librarian reported the receipt of the following exchanges :

Berliner Entomol. Zeitschrift, LI, Nos. 2 and 3.

Zeitschrift f. wissenschaftliche Insektenbiologie, III, No. 1.

Proc. Amer. Acad. Arts and Sciences, XLII, Nos. 20-25.

Dr. Felt exhibited a large series of original photomicrographs illustrating the wing venation and genitalia of Cecidomyiidae. He is engaged in preparing a monographic account of this group, and stated that these flies vary greatly in structure. Some 750 European forms have been listed and it is probable that our fauna is somewhat richer, possibly totaling 1,000 or 1,200 species. The habits and general biology of the group together with the methods of collecting were discussed in an informal way.

Professor Wheeler exhibited photographs and specimens of the agricultural ants which occur in the arid regions of the southwest. These possess a curious arrangement of long hairs underneath the head similar to those which have been found in the ants of the Sahara. He had thought that these were adaptations for carrying water, but among the specimens of a species kept in captivity he could find no such use made of the hairs. He suggests that these are more likely used for toilet purposes, acting as a brush to assist the strigil of the leg. Professor Wheeler also exhibited some excellent photographs of ants.

Mr. Joutel spoke of the finding of a Ptinid beetle (*Gibbium scotias*) at the Produce Exchange by Mr. Davis. This is an unusually rare species.

MEETING OF APRIL 16, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair with thirteen members and two visitors present.

The librarian reported the receipt of the following exchanges :

A Collection of Ants from British Honduras by Wm. M. Wheeler. Bull. Am. Mus. Nat. Hist., XXIII, pp. 271-277.

Canadian Entomologist, XXXIX, No. 4.

Verhandl. d. k. k. bot.-zool. Gesellschaft. Wien, LVII, No. 1.

Zeitschrift f. Wissenschaftliche Insektenbiologie, III, No. 2.

The Insect World, XI, No. 3.

Georgia State Board of Entomology, Bull. No. 23.

Mr. Davis of the field committee reported that there would be a society excursion to Newfoundland, N. J., on April 26.

Professor Wheeler gave an interesting talk on the genus *Formica* and said in part as follows :

The genus *Formica* was the only one recognized by Linnæus as including the various species of ants ; but gradually it became divided, first by Latreille and Fabricius, and later by others until now it includes only a small number of our species. All species belonging to it are found in the North Temperate Zone, none extending as

far south as the Equator and they are of wide distribution. This genus can be separated into five groups, all of which are found in North America. These groups center about *F. sanguinea*, *exsecta*, *rufa*, *pallidefulva* and *fusca*. The genus apparently originated in the Rocky Mountains, probably in Colorado as the species belonging to it are found there in greatest number and variety. It is unfortunate therefore that the European forms should have been known and described before those of America, as they are probably only varieties of the latter. The consideration of the different groups is interesting because of the differences in habit. The *sanguinea* group represented by the well-known *sanguinea* form of Europe, which differs slightly from our own, includes a number of distinct species and the commonest form with us is *rubicunda*. The ants belonging in this group can be distinguished by the distinctly notched clypeus. The *exsecta* group is represented by the European *exsecta*. In this division the clypeus is entire but the posterior margin of the head is incised and the species have the habit of cutting off the heads of their foes. The *rufa* group is represented by *rufa* and a few other forms in Europe and many forms in this country and could be again divided into smaller groups. *Rufa* forms are exceedingly abundant in Colorado; and in the Rocky Mountains in general, at an altitude of between 7,000 and 9,000 feet. Some of these forms very closely resemble the European *rufa*, *pratensis* and *truncicola*. The *pallidefulva* group which is recognized by the very slender thorax and the small colonies is not represented in Europe. *F. schaufussi* is the common species of this division and it is widely distributed in the United States east of the Rocky Mountains. The *fusca* group is the most widely distributed of all and is represented throughout the northern hemisphere. It is represented in Alaska and in Colorado in the mountains up to an altitude of 12,000 ft. In the west *fusca* runs into many varieties, while *subsericea* is one of the commonest forms with us in the eastern states. The species of this group are recognized by the slender antennæ. Concerning the habits of the insects Dr. Wheeler said that the forms belonging to the *pallidefulva* and *fusca* groups were widely distributed while those belonging to the other groups—*sanguinea*, *exsecta* and *rufa*—were parasitic upon them and hence sporadic in occurrence. In studying a species—*difficilis*—of one of the parasitic groups (*microgyna*), in which the queens are of very small size, it was found that the queen layed its eggs in the nest of *schaufussi*, the parasitized forms, where they were cared for by the workers of *schaufussi* which in turn died off owing to the fact that there was no queen of the latter to continue the species. In Tunis Dr. F. Santschi found a species of *Bothriomyrmex* parasitic in the nest of *Tapinoma*. In this case the queen of the former kills that of the latter and rests upon its dead body where it is immune to attack. Gradually it acquires the odor of the new nest and is adopted by the *Tapinoma* workers, who die off in due time, because they have no queen to propagate their species. Huber found that the workers of *sanguinea* went out and robbed the nest of *fusca* of young, brought them to their own nests and reared them. In experimenting with these forms in Connecticut last summer Dr. Wheeler found that by removing the wings of the *sanguinea* queens he changed their instinct and behavior. When new queens were placed with *fusca* workers, the latter attacked the queen *sanguinea* but later she retaliated, killed them off and gathered the cocoons of *fusca* and cared for them. It is probable that under normal conditions a weak colony is sought by the *sanguinea* queen for the purpose of establishing her own formicary. Thus, the queen possesses all the

instincts shown by the workers, and that the workers inherit their peculiar instincts from the queen.

The question of ants protecting plants was discussed by several members as was also that of the nesting habits of several species.

A few boxes containing some of the species of *Formica* were exhibited.

Mr. Schaeffer next spoke on Histeridæ and told of some interesting studies he had been making in this group. As a rule, he said, not much attention had been paid to this family. In considering the species the early authors had used the elytral striæ for specific separation. These he had found quite constant although in *Saprinus fimbriatus* and an allied form he had found some variation. The humeral striæ, however, vary to a considerable extent and if based upon these characters two of our species would have to be omitted from the list because they were found to be synonymous with others. Casey, in his studies, has laid some stress upon the punctuation of the pygidium, but Mr. Schaeffer found this to vary considerably in some instances and not to be altogether reliable. Notes were given concerning several of the species of the genus *Hololepta*. Altogether Mr. Schaeffer had found that when carefully studied these beetles exhibited some good specific characters and were not so difficult to determine as at first appeared. When questioned in regard to the habits of the insects Mr. Schaeffer said that they were carnivorous and that the character of the mandibles showed this to be the case. As a rule they were found in excrement or decaying matter but apparently they were not feeding on these substances but upon the larvæ of various kinds found in them. In the west he had taken *Hololepta yuccatæa* in the stems of the Yucca and *H. cacti* in decaying *Opuntia* between the dead and living tissue where dipterous and other larvæ were also found.

Mr. Davis stated that so far as he knew there were only three records in this country of *Histeridæ* having been observed feeding upon caterpillars. Mr. Joutel said that at Fort Lee he had observed a species doing this.

A box containing a number of Histeridæ was exhibited.

Mr. Dickerson made a few brief remarks on root maggots. He said there were several species of flies of the family Anthomyidæ, the larvæ of which were known as root maggots because of their habit of feeding upon the roots of plants. Several species have been found injurious both in Europe and America and two of these—the onion maggot feeding on the roots of onions and the cabbage maggot feeding on the roots of cabbage and several other cruciferous plants—had been particularly troublesome in New Jersey and several other states during the past few years. He told something of their habits and life history and said that owing to the fact that they lived under ground they were difficult to reach with insecticides of any sort. Two classes of remedies have been recommended. The one known as preventives, consists of placing something around the plant, such as a tarred paper disk, to prevent the eggs from being laid about the stem or if laid to prevent the maggots from getting to the roots. The other remedies might be termed destructive and consist of spraying or pouring such chemicals as carbolic acid emulsion around the plants in the effort to kill the maggots. But any remedies that are used must be timely and thorough. Further experiments against these pests are being carried on at the present time but so far none had been found which are altogether satisfactory. Phials containing maggots and puparia and pinned specimens of the adult flies were exhibited.

Mr. Davis showed several examples of the pellets formed by the “barred” owl.

He said he had found a number of these and many contained parts of insects. Those shown contained elytra and portions of *Dytiscus fasciventris* which the bird had evidently swallowed.

Mr. Southwick exhibited a box of Carabidæ containing a number of species of *Pterostichus*.

MEETING OF MAY 7, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair with twelve members present.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges :

Deutsche Entomol. Zeitschrift, 1907, No. 2.

Wiener Entomol. Zeitung, XXVI, No. 3.

Proc. Amer. Acad. Arts and Sciences, XLII, No. 6.

Stettiner Entomol. Zeitung, LXVII, No. 2.

Canadian Entomol., XXXIX, No. 5.

Anales del Museo Nacional de Montevideo, Tome III, Entr. I, 1906.

The Secretary read an invitation from the New York Academy of Sciences to participate in the exercises to be held in commemoration of the birthday of Linnæus on May 23.

On motion of Mr. Southwick, the president appointed as members of a committee to act for the society : Messrs. Southwick, Schaeffer and Barber.

Professor Wheeler mentioned some of the ants taken on the excursion at Newfoundland, N. J., among which was a new variety of *Formica exsectoides*, the female of which has a redder abdomen than the common form. He also mentioned a few of the myrmecophilous beetles taken and spoke concerning the habits of a moss which grew upon ants' nests and eventually drove away or exterminated the colony.

Mr. Leng exhibited a few beetles taken on April 28 in the hills made by the ant, *Formica exsectoides*, at Newfoundland, N. J. The species shown were : *Tachys incurvus* Say, *Platophagus parasitus* Lec., *Cedius ziegleri* Lec., *Heterius brunneipennis* Rand, *Megastilicus formicarius* Casey, *Cremostochilus castanea* Knoch., *Batriscus fossicauda* Casey, which is new to the New Jersey list of insects. All of the preceding have been recorded as living with ants.

Mr. Schaeffer exhibited some of the insects known as carriers of disease and remarked that the Diptera had more disease carrying or disease breeding members than any of the other orders of insects. He spoke of the mosquito in connection with malaria and yellow fever, the sleeping sickness caused by the tsetse fly in Africa, whose bite caused sickness and death to animals, the Tabanidæ which are troublesome to horses and cattle and instrumental in carrying disease, the house-fly which carries the germs of contagious diseases on its feet and body, ticks which are important carriers of disease, such as Texas fever among cattle. It has not yet been satisfactorily proved that fleas and bed bugs act as agents in carrying disease.

Mr. Dickerson spoke of the great impetus which had recently been given to the study of entomology because of the recognized value of a knowledge of disease breeding and carrying insects.

Mr. Zabriskie gave an interesting and instructive talk on the "Microscopical Examination of External Structures of Hemipterous Insects," illustrated by many lantern slides. Among the species dealt with were *Oncopeltus fasciatus*, *Sinea diadema*, *Acholla multispinosa* and *Phymata wolfei*.

The slides exhibited the microscopical peculiarities of the antennæ, particularly the differences to be noticed at the articulation of the different joints, the mouth parts, the legs in which the spines at the apex of the tibia are a noticeable feature, the wings showing the wing lock and hasp by means of which the two wings are locked together.

Professor Wheeler in behalf of Miss Adele M. Fielde presented to the society a number of separates of papers dealing especially with ants.

On motion the secretary was instructed to thank Miss Fielde for her gift.

H. G. BARBER,

Secretary.

THE NEW YORK ENTOMOLOGICAL SOCIETY

Organized June 29, 1892.—Incorporated June 7, 1893.

The meetings of the Society are held on the first and third Tuesday of each month (except June, July, August and September) at 8 P. M., in the AMERICAN MUSEUM OF NATURAL HISTORY, 77th Street and Eighth Ave.

Annual dues for Active Members, \$3.00.

Members of the Society will please remit their annual dues, payable in January, to the treasurer.

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DELEGATE TO THE N. Y. ACADEMY OF SCIENCES

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Price List of Entomological Publications

For Sale by the New York Entomological Society.

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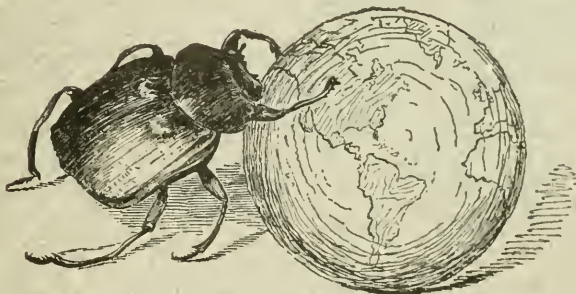
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No. 2.

LIST OF THE LAMPYRIDÆ FROM THE HUACHUCA MOUNTAINS, ARIZONA, AND DESCRIPTIONS OF NEW SPECIES.

BY CHARLES SCHAEFFER,
BROOKLYN, N. Y.

In the following list and descriptions three genera occur which are new to the fauna of the United States. These are *Euryopa*, *Discodon* and *Plectonotum*. The genus *Euryopa* Gorh. is a member of the tribe *Mastinocerini* as defined by Dr. Leconte and the genus as well as its new species and the new *Phengodes* will be described by Mr. H. S. Barber who is revising this tribe. *Discodon* Gorh. is closely allied to *Polemius* Lec. from which it differs only in having the outer claws of the middle and hind tarsi of the males cleft. Although remarking that this is the only character separating the two genera, Mr. Gorham,* however, described *difficile*, *bivittatum* and *melancholicum* as *Discodon* which by their uncleft middle and hind outer tarsal claws are plainly *Polemius*. *Polemius planicollis* Lec.† is a *Discodon* as the males have the outer claws of the middle and hind tarsi cleft; this may also be the case with some of our larger *Polemius* which are unknown to me. However, the different form of the tarsal claws alone is, in my opinion, not sufficient to give it more than subgeneric standing; for with the same right the divisions of the genera *Podabrus* and *Telephorus*, based on the form of the tarsal

* Biol. Cent. Am. Col., Vol. III, pt. 2.

† As *planicollis* is not preoccupied in this genus the change of name proposed by Dr. Gemminger is not necessary.

claws, could be elevated to generic rank, which Mr. Gorham, however, advocates.

The genus *Plectonotum* Gorh. is closely allied to *Silis* and *Polemius* and was erected on the form of the male thorax which appears as if the basal half of the reflexed lateral margin, from the incisure to the basal angles, is cut away. The modifications of the lateral margin of the known species of *Silis* and *Polemius* is so greatly diversified that the erection of a new genus on this character alone is hardly justified.

Mr. Gorham in the "Biologia" describes *basalis*, *nigrita*, *combusta*, *transfixa*, *fulvipes* and *lineola* as *Silis*, but if we follow Leconte, these species have to be placed in the genus *Polemius*.

The genus *Ditemnus* Lec. is made a synonym of *Silis* by Mr. Gorham. This is correct as far as the lateral modifications or processes of the thorax are concerned, but Dr. Leconte in his original description gave, besides this, the different form of the palpi as an additional character. How far the palpi differ in the species of *Ditemnus* and *Silis* I am, however, unable to say, as I know only *D. bidentatus* and a very small portion of the numerous described species of *Silis*.

The following list of the Lampyridæ from the Huachuca Mountains is interesting, as it shows more than any other family the Sonoran character of the coleopterous fauna of that region.

<i>Rhyncheros sanguinipennis</i> Say.	<i>Chauliognathus misellus</i> Horn.
<i>Lycus fernandesi</i> Duges.	" <i>opacus</i> Lec.
<i>Lycostomus fulvellus</i> Lec.	" <i>limbicollis</i> Lec.
" <i>rubescens</i> n. sp.	<i>Discodon bipunctatum</i> n. sp.
" <i>loripes</i> Chev.	" <i>flavomarginatum</i> n. sp.
<i>Cæniella amplicornis</i> Lec.	<i>Polemius niger</i> n. sp.
<i>Lygistropterus rubripennis</i> Lec.	" <i>strenuus</i> Lec.
<i>Plateros</i> sp.	" <i>binotatus</i> Fall.
" <i>nigerrimus</i> n. sp.	" <i>arizonensis</i> n. sp.
<i>Ellychnia californica</i> Mots.	<i>Silis abdominalis</i> n. sp.
<i>Pyropyga simplex</i> Lec.	" <i>nigerrima</i> n. sp.
<i>Phengodes</i> n. sp.	<i>Plectonotum excisum</i> n. sp.
<i>Euryopa</i> n. sp.	<i>Podabrus mexicanus</i> Gorh.
<i>Chauliognathus profundus</i> Lec.	" <i>comes</i> Lec.
" <i>ineptus</i> Horn.	<i>Malthinus subcostatus</i> n. sp.
	<i>Malthodes bicolor</i> Lec.

NOTES AND DESCRIPTIONS.

Lycostomus rubescens, new species.

Head black; beak moderate. Antennæ black, serrate; third joint slightly longer than fourth. Prothorax orange-yellow, more or less densely pubescent. Elytra reddish, costate and reticulate, the alternate intervals slightly more prominent than the others. Body beneath reddish, except the metasternum which is more or less dusky and the abdomen which is also sometimes feebly dusky. Femora more or less blackish. Tibiæ and tarsi black. Length 12-13 mm.

Male. — Antennal joints more elongate and serrate than in the female; penultimate segment triangularly incised at middle, with the angles of the incisure rounded. Last ventral segment as usual.

Female. — Antennæ feebly serrate, joints shorter than in the male. Last ventral segment lobed at middle, the lobe triangularly incised at middle.

Huachuca Mts., Arizona.

This species is allied to *fulvellus* Lec. from which it differs, besides coloration, in having the antennæ more serrate and the penultimate ventral segment of the male differently formed. It resembles also quite closely the Mexican *lineicollis* Chev., but that species has the underside of body, legs, a broad thoracic and a scutellar spot, black. The known North American species of the genus *Lycostomus* may be separated by the following table:

- | | |
|--|-------------------------|
| 1. Elytra unicolorous, either yellow or reddish..... | 3 |
| Elytra in great part black or red, with an apical black space..... | 2 |
| 2. Underside of body and legs black; elytra black with elongate humeral spot and sometimes the base on each side of suture fulvous..... | <i>lateralis</i> Melsh. |
| Underside and legs red, tarsi black; thorax and elytra red, the latter at apical fourth, black; penultimate ventral segment of male broadly, triangularly emarginate..... | <i>sanguineus</i> Gorb. |
| 3. Underside in great part black; abdomen with last two segments and sides more or less fulvous; thorax with a median black spot dilated at base and sometimes near apex; penultimate ventral segment of male truncate-emarginate. | |

fulvellus Lec.

- | | |
|--|----------------------|
| Abdomen unicolorous, rarely feebly dusky at middle in <i>rubescens</i> | 4 |
| 4. Prothorax shining, not pubescent; third joint of antennæ as long, or nearly as long, as the next two; penultimate ventral segment of male emarginate-truncate | <i>loripes</i> Chev. |

Prothorax feebly shining, pubescent; third antennal joint slightly longer than fourth, but distinctly shorter than joints three and four; penultimate ventral segment of male triangularly incised at middle, angles of incisure rounded.

rubescens n. sp.

Plateros nigerrimus, new species.

Entirely black. Head feebly punctate, transversely impressed between the eyes. Antennæ distinctly serrate in the male, more feebly and the joints broader in

the female; second joint very small; third triangular, with the apex as wide as long; fourth joint distinctly longer than the third, but not wider; fifth and following joints similar to the fourth, gradually decreasing in width, the outer joints much narrower than the basal joints especially in the male. Thorax with a deeply impressed line near base, which extends to the middle of the disk; apex with a rather indistinct median carina; sides somewhat coarsely punctured; disk smooth; surface sparsely pubescent, with fine black hairs. Elytra with the usual costæ and reticulate intervals, the alternate costæ only very feebly stronger than the others. Body beneath shining, sparsely pubescent; abdomen sparsely and finely punctate, the first three or four ventral segments with a number of finely impressed transverse lines. Penultimate ventral segment of the male arcuate-emarginate, last ventral narrow, elongate. Last ventral of the female rounded at tip. Length 6-6.5 mm.

Huachuca Mts., Arizona.

A moderately large series shows that the color is constant, by which it will be easily distinguished from the described North American and Mexican species, except *carbonarius* from Guatemala, which, according to the very short description, has narrower and longer elytra and an obsolete basal groove.

***Discodon bipunctatum*, new species.**

Head black, finely punctate. Antennæ black, joints elongate cylindrical. Thorax as long as wide in the male, wider than long in the female; apical margin broadly rounded and continuous with the lateral margin; hind angles obtuse, feebly rounded; basal transverse impression distinct, limited on each side some distance from the hind angles by an indistinct fovea; surface finely and sparsely punctate; color reddish or yellowish with a median black vitta of nearly equal width from base to apex and a black spot near the lateral incision. Elytra black; scabrous, more roughly sculptured near apex than base; costæ not well defined. Underside, except thorax, black. Length 10-12 mm.

Male. — Antennæ not quite reaching to apex of elytra. Prothorax at about middle of lateral margin incised; apical angle of the incisure rounded, basal angle of the incisure obliterated by the lateral margin continuing from the incisure to the basal angle of the prothorax in almost a straight line. Outer claw of front tarsi broadly lobed at base; outer claw of middle and hind tarsi cleft at tip; inner claws, as usual, simple. Penultimate ventral segment broadly, triangularly emarginate; last ventral, as usual, deeply divided.

Female. — Antennæ similar to the male but shorter. Prothorax wider than long; lateral margin of about middle distinctly sinuate. Claws, as usual, simple. Last ventral segment rounded at apex and feebly incised at middle.

Huachuca Mts., Arizona.

By description this is near *Polemius regularis* Fall, described from a single female, which is said to have the sides of thorax parallel and broadly arcuate and without lateral black spot. The form of thorax is similar to *Polemius planicollis* Lec.

The genus *Discodon* Gorb. is, as stated already above, very closely allied to *Polemia* Lec. from which it differs only in having the outer claws of the middle and hind tarsi of the males cleft.

***Discodon flavomarginatum*, new species.**

Head black, front yellow; black part finely punctate. Antennæ black, slender, extending below middle of elytron; joints elongate. Thorax transverse; apical margin broadly rounded, angles entirely obliterated; side margin broadly reflexed, nearly parallel and feebly rounded; lateral incisure at about basal fourth, deep and oblique; hind angles rounded; basal margin broadly rounded at middle; basal impression deep, limited on each side by the reflexed side margin; color reddish, with a black median vitta of nearly equal width, narrower than the pale space on each side. Elytra feebly dilated a little below the humeri; surface finely scabrous, costæ scarcely evident; color dark brown, lateral margin rather broadly pale. Beneath, except thorax, black. Outer claw of anterior and intermediate tarsi broadly lobed; outer claw of posterior tarsi cleft. Penultimate ventral segment broadly, triangularly emarginate. Last ventral deeply divided. Length 14 mm.

Huachuca Mts., Arizona.

Judging from the short description this differs from *Polemia princeps* Lec., which it seems to resemble in the broadly rounded hind angles and the lateral incision of thorax at about basal fourth. From the allied Mexican species it differs in having the outer claw of only the hind tarsi cleft.

***Polemia niger*, new species.**

Entirely black, except mandibles. Head finely punctate. Antennæ slightly flattened, extending to the middle of elytra. Thorax transverse; anterior margin broadly rounded, angles obliterated; lateral margin rather narrowly and relatively strongly reflexed, sides gradually widening towards base, feebly undulate slightly before middle; base feebly arcuate, hind angles broadly rounded. Elytra scabrous and feebly costate, side margin below humeri feebly explanate. Last ventral segment rounded at apex. Length 9 mm.

Huachuca Mts., Arizona, one female.

Distinct from any of the North American species by the uniform black color, but seems to be very close to *Discodon melancholicum* Gorb.

***Polemia arizonensis*, new species.**

Head black, pale in front, densely punctate. Antennæ black, first two or three joints more or less pale. Thorax transverse, apical margin broadly rounded, angles obliterated; side margin obliquely incised at about middle; basal margin feebly rounded, basal impressed line distinct, hind angles rounded; color reddish yellow without black vitta or spot. Scutellum reddish. Elytra black, scabrous; costæ indistinct; surface finely pubescent, which gives the elytra a somewhat pruinose aspect. Underside of body reddish, metasternum, tibiae, except at base, and tarsi, black. Penultimate ventral segment very deeply triangularly emarginate; last ventral deeply divided. Length 7.5 mm.

Huachuca Mts., Arizona.

This species is very near *binotatus* Fall, but differs in the shorter and wider third, fourth and fifth antennal joints and the immaculate, shorter thorax, with broadly reflexed sides near hind angles.

The female differs from the above described male, in having the lateral margin entire, feebly sinuate, and shorter and slightly stouter antennal joints.

***Silis nigerrima*, new species.**

Black, finely pubescent with short, cinereous hairs, which are longer on the thorax than elytra. Head minute and sparsely punctured. Antennæ slender; thorax very sparsely, minutely punctate, apical margin broadly arcuate; disk shallowly depressed at middle. Elytra not coarsely punctate, at the extreme base very finely and densely punctate; costæ scarcely evident. Body beneath pubescent with longer cinereous hairs than on elytra. Length 11-12 mm.

Male. — Antennæ longer than the entire body; joints clothed rather densely with short, prostrate, pale pubescence. Thorax with two broad lateral processes; the apical process is directed backwards, almost touching the basal process with its apex, which is bent slightly upwards; the basal process is laterally compressed and slightly excavated near apex; below the posterior process the lateral margin is arcuate-emarginate from the process to the basal angles, which are obtuse. Penultimate ventral segment broadly, triangularly emarginate; last ventral, as usual, longitudinally divided.

Female. — Antennæ slender, but shorter than the body. Thorax transverse, apical margin broadly arcuate, continuous with the side margin; sides very distinctly sinuate slightly before middle and feebly so before basal angles, which are obtuse and very feebly rounded. Last ventral segment broadly rounded.

Huachuca Mts., Arizona.

The black color, the lateral thoracic processes of the male, which are somewhat similar to those of *perforata* Lec., and the form of the female thorax makes this an easily recognizable species. The Mexican *laticollis* Gorh., which is also black and has the male thorax similarly formed, is a shorter and more robust insect, with wider thorax, shorter antennæ and with last abdominal segment flavous.

***Silis abdominalis*, new species.**

Black, front of head, the first two joints of antennæ, scutellum, legs, except tarsi and apex of hind tibiæ, sides of abdominal segments and the last two ventral segments reddish. Head finely punctate and sparsely pubescent. Antennæ slender. Thorax almost impunctate; apical margin broadly arcuate. Elytra rather coarsely punctate, costate and feebly pubescent. Body beneath more evidently pubescent than the elytra. Length 5 mm.

Male. — Antennæ not quite as long as the entire body, joints elongate, with very feeble pubescence. Thorax with two broad lateral processes; the apical process is directed backwards, short and somewhat truncate at tip; the basal process is broad, feebly narrowing to apex, where it is feebly emarginate; below the posterior process the lateral margin is very feebly emarginate; hind angles rather acute. Penultimate

ventral segment broadly, triangularly emarginate; last ventral longitudinally divided.

Female. — Antennæ reaching almost to middle of elytra; joints less elongate than in the male. Thorax about twice as wide as long; apical margin truncate; front angles obliterated; lateral margin rather strongly reflexed, feebly arcuate, sinuate at middle and near the hind angles, the latter rather acute. Last ventral truncate at apex; on each side of middle the segment is distinctly impressed.

Huachuca Mts., Arizona.

This species which occurs also in the Chiricahua Mts., Arizona (E. A. Schwarz), is related to *perforatus* Lec., but the much shorter lateral thoracic processes of the male and the different color of abdomen and legs will separate *abdominalis* from that species.

The situation of the lateral margin of thorax at middle is in some specimens feeble, in others very pronounced. The ventral segments are more or less distinctly bordered with yellow.

***Plectonotum excisum*, new species.**

Black, prothorax and front of head pale or red. Head and thorax minutely and sparsely punctate. Thorax with front margin arcuate, angles obliterated; basal margin truncate at middle, slightly oblique each side, angles obtuse. Elytra rugosely punctured and finely pubescent. Body beneath sparsely and finely pubescent. Length 5 mm.

Male. — Lateral margin of thorax feebly obliquely narrowing, from the hind angles to basal half and at this point suddenly dilated, with the sides broadly rounded, reflexed and continuous with the apical margin. Penultimate ventral segment feebly emarginate; last ventral segment divided.

Female. — Lateral margin of thorax very feebly sinuate at middle. Last ventral segment with a small arcuate emargination at middle of apical margin.

Huachuca Mts., Arizona.

The genus *Plectonotum* Gorh. is closely allied to *Silis* and *Polemius* and was erected for a small black species from Ecuador on the peculiar form of the thorax of the male.

***Malthinus subcostatus*, new species.**

Head black, front reddish, finely pubescent. Antennæ black, slender. Thorax red, subquadrate, front margin very feebly rounded; front angles obtuse; sides nearly parallel, straight; hind angles obtusely rounded; basal margin truncate at middle and on each side oblique; surface smooth, shining. Elytra about one third shorter than the abdomen, black, apex yellow; surface coarsely sculptured and very indistinctly punctured, the punctures not forming striæ; each elytron with two moderately pronounced costæ. Body beneath and legs piceous, except head and thorax, which are reddish. Length 4 mm.

Huachuca Mts., Arizona, one female.

Differs from *atripennis* and *occipitalis* by the different coloration and sculpture of elytra; the red thorax, black legs, and sculpture of elytra will separate it from allied Mexican species.

STUDIES ON MYRMECOPHILES. I. CREMASTOCHILUS.

By WILLIAM MORTON WHEELER,
NEW YORK CITY.

The phlegmatic beetles of the exclusively North American genus *Cremastochilus* have been extensively collected by coleopterists, but very little study has been devoted to their habits. And though all collectors know that these beetles, of which some twenty-five species have been described, are regular myrmecophiles, it is a rare experience to find one of them mounted with its host ant in a collection. Indeed, with the exception of a few data published several years ago (1890) by one of our eminent coleopterists, Dr. A. E. Schwarz, I can find no records of the species of ants among which the *Cremastochili* pass so much of their lives. I therefore publish the following observations in the hope that they may induce some of our entomologists to make accurate notes of their future captures of these extraordinary insects.

Mr. L. H. Joutel having kindly identified the *Cremastochili* in my collection, I am able to present the following records of fourteen species, including those mentioned by Schwarz :

1. *Cremastochilus spinifer* Horn. — A single specimen taken June 6, 1902, from a nest of *Pheidole desertorum* Wheeler under a stone in the desert near Fort Davis, Texas.

2. *C. wheeleri* Lec. — Taken repeatedly during July and August, 1903, and 1906 at Colorado Springs, Manitou and Boulder, Colo., in the nests of *Formica oreas* Wheeler, *crinita* Wheeler, *microgyna* Wheeler and its variety *rasilis* Wheeler, *ciliata* Mayr, and *rufa* L. subsp. *obscuripes* Forel.

3. *C. crinitus* Lec. — Taken repeatedly during May, 1903, by Messrs. C. T. Brues, A. L. Melander and myself near Austin, Texas, in the nests of *Formica fusca* L. var. *gnava* Buckley.

4. *C. retractus* Lec. — Also taken at Austin in nests of *F. gnava*, but much less frequently than *C. crinitus*. I have also taken it (July 19, 1903) in nests of *F. ciliata* at Colorado Springs.

5. *C. harrisi* Kirby. — Mr. Wm. Beutenmüller has given me a few specimens of this beetle which he took in the Black Mts. of North Carolina in nests of *Formica pallidefulva* Latr. subsp. *schaufussi* Mayr. I have also found it as late as September 16, at Lakehurst, N. J., in a

colony of *F. sanguinea* L. subsp. *rubicunda* Emery var. *subintegra* Emery, with *F. schaufussi* as slaves.

6. *C. canaliculatus* Kirby. — Taken in the following localities and with the following ants: Newfoundland, N. J. (April 27, 1907), with *F. schaufussi*, and *rubicunda*, with *fusca* L. var. *subsericea* Say as slaves (Davis and Wheeler); Westfield, N. J. (May 18), with *F. exsectoides* Forel (Davis); Andover, Mass., with *F. subsericea* (A. P. Morse).

7. *C. castaneæ* Knoch (Fig. 1). — Occurring, like the preceding, with a number of species of *Formica*: Black Mts., N. C., with *F. subsericea* (W. Beutenmüller); Newfoundland, N. J. (April 27, 1907), with *F. schaufussi* and *exsectoides* (Davis and Wheeler); Washington, D. C., with *F. rufa* subsp. *integra* Nyl. (Schwarz); same locality with *F. schaufussi* (Pergande); Bronxville, N. Y. (April 19, 1904; April 19, 1908), with *F. schaufussi* and with *Polyergus rufescens* Latr. subsp. *lucidus* Mayr with *F. nitidiventris* Emery as slaves (Wheeler); Greenville, N. Y. (July 30, 1904), with *F. subsericea* (Wheeler); Westfield, N. J. (May 18), with *F. exsectoides* (Davis); Cañon City, Colo. (March 23), with *F. fusca* var. *argentata* Wheeler (Rev. J. Schmitt).

8. *C. mexicanus* Schaum. — Taken by Mr. C. Schaeffer in the Huachuca Mts. of Arizona, in a nest of *F. gnava*, and by Mr. H. A. Wenzel in the same locality in nests of *F. rufa obscuripes* var. *rubiginosa* Emery.

9. *C. variolosus* Kirby. — Recorded by Schwarz as occurring in nests of *Stenamma* (*Aphaenogaster*) *fulvum* Roger.

10. *C. squamulosus* Lec. — This species, which occurs in Georgia and Florida, is cited by Schwarz as living with *Camponotus esuriens*, an ant which does not occur in the United States. What has been passing under this name is in all probability *C. abdominalis* Fabr. var. *floridanus* Buckley or one of the southern forms of *C. maculatus* Fabr.

11. *C. planatus* Lec. — This and the two following species were taken during July and August by Mr. H. A. Wenzel in Miller Cañon, Huachuca Mts., Ariz. (5,000 to 6,000 ft.) in nests of *F. rubiginosa*.



FIG. 1. *Cremastochilus castaneæ* Knoch. $\times 4$.

12. *C. planipes* Horn.

13. *C. opaculus* Horn.

14. *C. ineptus* Horn. — Mr. H. W. Wenzel informs me that this species was taken in the same locality as the three preceding species and with the same ant by Mr. H. Kaeber.

These records show that in the great majority of cases the hosts of *Cremastochilus* belong to the genus *Formica*. Although *C. spinifer* has been taken with *Pheidole*, *C. variolosus* with *Aphænogaster* and *C. squamulosus* with a species of *Camponotus*, it is practically certain that these are accidental or irregular associations. Hence we should expect the beetles to be found only within the geographical range of the genus *Formica*, and this appears to be the case. Even the four species cited in the "Biologia Centrali-Americana" (*C. saucius*, *planatus*, *mexicanus* and *crinitus*) occur within the United States, and have been taken in Mexico only on the high northern plateau where *Formica* also occurs. It is not improbable that some or all species of *Cremastochilus* prefer to live with particular species of *Formica*, but this cannot be proved without a great many more records than I have been able to obtain heretofore.

Haldeman (1848) seems to have been the first to publish an account of the occurrence of *Cremastochilus* in ant-nests, but the correspondence of Hentz, Say and Harris published by Scudder in 1869, shows that as early as 1825 Hentz had seen ants dragging a specimen of the beetle over the ground. Horn (1871) says that he found *C. schaumi* and *angularis* "very frequently in ants'-nests and in one instance apparently eating the pupæ. Several times I have seen large black ants dragging specimens of *schaumi* along the surface of the ground towards their nests and on examination have frequently succeeded in obtaining from nests specimens that had previously been dragged there. Why these insects are found with ants is a question to which I am not prepared to give a definite answer, unless, as I suspect, the fossæ at the anterior angles and the finely punctured and apparently perforated patches under the hind angles are glandular and yield some secretion grateful to the ants." The patches to which Horn alludes are tufts of golden yellow or orange-red hairs, the trichomes, which characterize so many myrmecophilous insects, and are most beautifully shown on various parts of the body in beetles of the genera *Adranes*, *Claviger*, *Paussus*, *Lomechusa*, *Xenodusa*, etc.

In 1886 Horn published some additional notes on the habits of

Cremastochilus. He received from J. J. Rivers, of California, a specimen of *C. schaumii* with the posterior thoracic angles mutilated, and from J. Hamilton, of Allegheny, Pa., one of *C. canaliculatus* in a similar condition. Concerning these specimens he writes as follows: "It is my belief that the irregularities in the Rivers and Hamilton specimens are the work of the ants, with which the specimens were found and I have long held the opinion and have so published it, that the pubescent depressed spaces near the front and under the hind angles of most of the species, are glandular, and give a secretion very palatable to the ants, and these almost reasoning insects, finding the processes in their way have deliberately removed them, either partially, as in the Rivers specimen, or entirely as in the other." Horn also quotes from Schwarz the following interesting observation on a species of *Cremastochilus* which was apparently living with *Formica exsectoides*: "In May, 1883, while on an excursion in the vicinity of Washington, I came across a large ant hill constructed by a species of *Formica* which is allied to, but not identical with, *F. rufa*. My attention was at once attracted by three objects on top of the ant hill, which at first glance appeared to be compact masses of ants. Upon looking closer to each of the masses proved to consist of a living *Cremastochilus* attended by numerous ants which held on with their mandibles to the legs, the head, the sides of the thorax of the beetles, in short wherever there was a chance for them to hold on. That they did not intend to do any harm to the beetles was evident, and it seemed to me that they intended to prevent the escape of the *Cremastochili* from their colony. Herein they were evidently successful, as upon waiting for a considerable length of time there was no change in the situation. I then proceeded to investigate the interior of the ant hill, which consisted of numerous layers of intricate galleries and chambers, all built of rather loose earth without any sticks or other debris. Within the chambers several more *Cremastochili* were found but not attended to by ants."

Hamilton (1888-1889), in his excellent list of myrmecophilous insects, cites a number of species of *Cremastochilus* but without the names of their hosts. Of *C. canaliculatus* he says, that it is the most abundant species at Allegheny, Pa. "It is found from April till June with large black ants, perhaps of two species, inhabiting usually under stones or other covering, but not infrequently throwing up small mounds in old pastures and open ground. The nests under

stones rarely yield more than two beetles, but the mounds often contain five or six at once, and with care will yield a crop every two or three weeks. The beetles are found near the surface, none having been taken below the plane of the base. As soon as it becomes warm, from the middle of April onward, this species takes leave of the ants and flies away; like the *Cicindelæ* it only flies during the hottest sunshine and for short distances, alighting suddenly on a stone or the middle of a dusty road. Its flight is low and heavy, and after it lights cannot take wing again without some delay, and I have seen it flying as late as August. Whether after having left, the same beetles return and breed among the ants, or whether it is a new brood that claims their hospitality for the winter, is absolutely unknown. I never could satisfy myself as to whether those found in the nests in June had returned or were just preparing to leave."

In 1891 Luggar published a few observations on *C. knochi* Lec. which he found at St. Anthony Park, Minnesota. He saw the beetles mating during the early spring in an open field and being dragged about by ants (species not mentioned). One individual "was found sitting right over one of the small entrances of an ant nest. With slow and very deliberate actions the beetle gradually enlarged the hole under it, and in the course of nearly seven hours disappeared from view." Luggar figures a peculiar cavity which was excavated in the earth by five pairs of *C. knochi* kept in a jar.

The observations above cited are all or nearly all that have been published on the habits of *Cremastochilus*. In order to ascertain the relations of these beetles to the ants I have on several occasions installed specimens of *C. crinitus* in artificial nests with *F. gnava* and of *C. canaliculatus* and *castaneæ* with *F. subsericea*, *schaufussi*, *nitidiventris* and *integra*. Beetles kept with the colonies in which they are first taken, are treated with complete indifference by the ants. This is sometimes the case also when the beetles are placed in a strange colony of the same species of *Formica*, especially if this is *F. schaufussi*. More frequently a different picture, like that seen in the following experiment, is exhibited: April 19 I placed two *C. castaneæ*, that had passed the winter with *F. schaufussi*, in a Fielde nest containing several hundred workers and two deälated queens of *F. integra*. The beetles at once "feigned death" and remained for several minutes lying on their backs, with retracted legs and antennæ. They were not noticed till they stretched out their appendages and began to walk

about. Then the ants at once pounced upon them with open mandibles and curved their gasters forward between their hind legs, in the attitude assumed by all the forms of *F. rufa* when irritated and about to discharge their formic acid. There could be no doubt that the ants were hostile and irritated but nevertheless the acid batteries were never called into action, probably because there is a disinclination to use these organs within the narrow confines of the nest. They contented themselves with biting the beetles and pulling their legs. It soon became apparent, however, that the biting was largely restricted to the posterior corners of the beetle's thorax. The ant clung to the side of the beetle in the position shown in Fig. 2, seized the posterior angle between its mandibles in such a manner that the toothed border of one mandible fitted into the arcuate groove which separates the angle from the more convex portion of the thorax, and then moved its head from side to side in a vigorous attempt to tear away the triangular piece of chitin bearing the cushion of trichomes on its ventral surface. Several of the workers busied themselves thus for periods varying from one to twenty minutes, and one pertinacious individual gnawed at the posterior thoracic angle of the same beetle for an hour and a quarter. The anterior angles and the legs were also gnawed and pulled, but much less frequently and persistently. With a pocket lens it was possible to study the mouth-parts of the gnawing ant. There was no attempt to lick any portion of the beetle's body. In fact, the ant, while gripping the thoracic angle, kept its mouth tightly closed and held its maxillary palpi back against the gula while the labial palpi, with a rhythmic movement approached, but did not actually touch, the trichomes. The gnawing seemed to irritate or, at any rate, to stimulate the beetle, for it stalked rapidly about the nest carrying the ant on its back. Whenever the anterior part of its body was touched by an ant, it quickly retracted its antennæ, so that it could never be seized by these appendages. Eventually it managed to force its head and thorax into a corner or under the wet sponge.

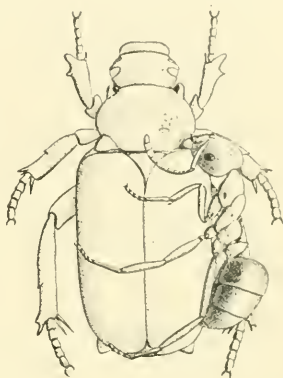


FIG. 2. *Cremastochilus castaneus* with *Formica integra* worker gnawing at one of its posterior thoracic angles. $\times 4$.

Then the ant had to release its hold. Sometimes it continued to gnaw at the exposed abdomen, elytra or legs, but sooner or later it left the beetle to its own devices. The creature then remained for hours in somnolent quiescence till some enterprising ant would pull it out of its ostrich-like concealment by one of its hind legs and the gnawing at the posterior thoracic angles and the march of the beetle around the nest would recommence.

The beetles were observed daily for several weeks. At times I was inclined to believe that the ants had grown accustomed to their presence and were beginning to tolerate them with indifference, but closer observation showed that whenever the beetles left their retreat and wandered about the nest they were sure to be assaulted by a few of the ants and to have their thoracic angles gnawed till they again succeeded in concealing themselves. This behavior on the part of the ants continued without modification till June 10 and 13, when the two beetles died and were placed on the refuse heap by the *integra* workers.

A specimen of *C. castaneæ* was also placed in a nest of *F. subsericea*. Though this ant has a much more cowardly disposition than *F. integra*, it nevertheless attacked the beetle as soon as it spread its legs and proceeded to move about the nest. There was the same gnawing at the posterior thoracic angles as exhibited by *integra*, but more pulling at the beetle's legs. The *subsericea* workers treated the beetle much as they treat an alien queen: each seized a leg and then, fixing its claws in the towelling or sponge of the nest, began to pull. As the mandibles of *subsericea* are weaker than those of *integra*, there was even less danger of injury to the beetle, which dragged the ant along till it found a corner in which it could bury its head and thorax and enjoy a spell of immunity from their attacks.

The imaginal *Cremastochili* seem to require no food. At any rate, I have never seen them eating any substances in the nests or being fed by the ants, although I have kept them under observation from three to seven weeks. Some of the nests in which they were confined contained ants' eggs and young larvæ, but these were completely ignored by the beetles. In the natural nests the latter are sometimes present in much greater numbers than is suggested by Hamilton's statement above quoted. April 27, 1907, at Newfoundland, N. J., Mr. Wm. T. Davis and I took from a single nest of *F. schaufussi* 24 *Cremastochui*, belonging to two species, *castaneæ* and *canaliculatus*.

This is the more surprising because the colonies of *schaufussi* are very small compared with those of *subsericea*, *integra*, *exsectoides*, etc.*

From the foregoing observations we may conclude that the *Cremastochili* are not true guests, or symphiles, as Wasmann supposed (1894), but persecuted intruders (synechthrans) that may eventually become indifferently tolerated guests (synœketes). This explains the observations of previous writers. The three *Cremastochili* which Schwarz found arrested by the *F. exsectoides* workers were, in all probability, individuals that had only just alighted on the mound, whereas those taken in the galleries of the nest were old inhabitants. The specimens with defective thoracic angles, described by Horn, had probably been mutilated by the ants, as he suggests. Such mutilations, however, would hardly be possible except in individuals that had just escaped from their pupa-cases and were still soft. The view here advocated is supported by the remarkable development of the protective devices of the *Cremastochili*: their hard armor, the extraordinary cup-shaped mentum which prevents the ants from getting at the mouth-parts and the facility with which they can withdraw their antennæ into deep grooves on the sides of the head.

But if this view is accepted, how are we to interpret the tufts of yellow hairs, or trichomes on the thoracic angles, their obvious fascination for the ants and the peculiar oily red "myrmecophile color" of some of the species (*C. saucius* and *spinifer*)? That the thoracic angles represent adaptations to myrmecophily can hardly be doubted. I have called attention to the remarkable manner in which these structures, at least in some of the species, fit the mandibles of the *Formica* workers. As the glands on these angles unquestionably emit some odor which simultaneously attracts and irritates the ants, one would be inclined to account for their development by supposing that they tend to withdraw the hostile attentions of these insects from more vulnerable organs.† But what are these organs? All parts of the

* Mr. Davis calls my attention to the fact that Hamilton's statements in regard to the flight of *Cremastochilus* are not strictly applicable to all the species. A considerable number of *C. harrisi* were seen by Mr. Davis during the past April flying along the roads in the sandy pine barrens at Lakehurst, N. J. They were very agile and difficult to catch, taking flight again after alighting with as much ease as *Cincindela*.

† It is interesting to note that the European and North American species of an allied genus of Cetoniine beetles, *Osmoderma* (*O. eremita* L., *eremicola* Knoch and *scabra* Beauv.), have long been noted for their peculiar odors. Concerning our

beetles' surface are thoroughly indurated and equally adapted to repelling the mandibular onslaught. There seems to be only one way out of the difficulty thus presented by the simultaneous development of these protective and alluring adaptations in the *Cremastochili*, and that is to regard these beetles as degenerate symphiles, forms that were once true guests, with more highly developed trichomes and living on much more amicable terms with their hosts. In having fallen from this estate they resemble certain species of *Paussus* that have been studied by Escherich. *Cremastochilus* has, in fact, all the ear-marks of a very senile genus. Its species, like somber hypochondriacs, are condemned by an ancient instinct to dwell in the busy emmet world without participating in its splendid activities. The weariness of a long and eventful evolution seems to lurk in their hard, pock-marked integument and rheumatic joints. Having outlived a period of abject sycophancy, they would, perhaps, return to a free and independent life, were it not that their brains have been enfeebled by too many generations of parasitism.

Nothing is known concerning the development of *Cremastochilus*. The larval and pupal stages are passed, in all probability, in the ant-nests, and from what has been learned of allied forms, like *Cetonia*, we should expect to find the larva in the vegetable débris of the nest. July 22, 1903, while examining a nest of *Formica microgyna* in Williams Cañon near Manitou, Colorado, I found besides a number of adult *C. wheeleri*, a single Cetoniine larva, which may be that of this beetle. It was buried in the vegetable débris and on being exposed by a stroke of my trowel, was at once seized and injured by the irate ants. It resembles rather closely the larva of *Osmoderma eremita* figured by Schiödt (De Metamorphosi Eleutheratorum Observationes, VIII, 1874, Tab. XI, Fig. 1). If it is the larva of *C. wheeleri* it is only about two thirds grown.

The mating of *Cremastochilus* sometimes takes place in the ant-nests. At any rate I have seen pairs of *C. castaneæ* and *canaliculatus* in copulâ in the outer galleries of *F. schaufussi* nests in April. Liebeck (1899) took the mating sexes of *C. leucostictus* Burm., which are

American species Harris (A Treatise on Some of the Insects Injurious to Vegetation, 1862, p. 42) says: "They have the odor of Russian leather, and give this out so powerfully that their presence can be detected by the scent alone, at the distance of two or three yards from the place of their retreat." This scent is retained for years in cabinet specimens.

very dissimilar, in the open field, and it is probable that this is the more usual mating place. The beetles undoubtedly spend much of their adult life with the ants. They certainly hibernate in the nests as they were found both by Hamilton and myself in the early spring (middle of April) in the upper galleries. Moreover, the dates above mentioned (p. 68) show that they may be found in the nests as late as July, August and September. It is probable, therefore, that the eggs are laid in May and that the adult beetles make their appearance towards the middle or latter part of the summer and then remain with their hosts till the following spring.

The genus *Cremastochilus* belongs to the Cetoniine subfamily of the Scarabæidæ and has its closest allies, curiously enough, in certain South African genera. These are in part myrmecophilous and in part termitophilous. To the former group belong *Plagiochilus intrusus* Wasmann (1900), *P. argenteus* Wasm. and *Myrmecochilus marshalli* Wasm. (Fig. 3), both occurring in the nests of a very common South African ant, *Plagiolepis custodiens*. To the latter group belong five species of *Cænochilus* (*termiticola* Wasm., *braunsi* Wasm., *glabratus* Boh., *hospes* Péringuey and *intrusus* Pér.). In this same region there are also a number of other myrmecophilous and termitophilous Cetoniinæ not so closely allied to *Cremastochilus*. Péringuey (1900) mentions *Placodidus compransor* and *Trichoplus schaumi* as occurring in the nests of *Plagiolepis*, and species of *Scaptobius* and *Lissogenius* as myrmecophiles. The same author surmises that *Trichostetha capensis* is termitophilous, and one who has seen this remarkable green and black beetle, which measures nearly 30 cm. in length and has its ventral surface covered with great tufts of orange-red hairs, can hardly doubt that it lives with ants or termites.

Other myrmecophilous Cetoniinæ occur both in Europe and in North America. In the former country the larvæ and pupæ of *Cetonia floricola* Herbst are very common in the nests of *Formica rufa* and *pratensis*; and in the United States, as Schwarz has shown, *Euphoria inda* L., *hirtipes* Horn and probably also *E. pilosicollis*

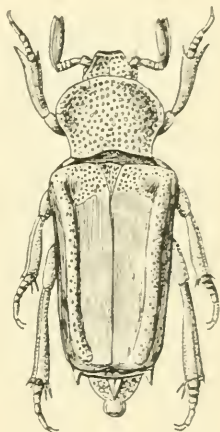


FIG. 3. *Myrmecochilus marshalli* Wasm. $\times 4$.
(After Wasmann.)

breed in ant-nests. The larva of *E. inda* is recorded from nests of *Formica integra* and the adult from those of *F. rufa obscuripes*. During the spring of 1906, while watching a large nest of *F. exsectoides*, I saw a *E. inda* fly from a distance, alight on the mound and at once bury itself out of sight in the earth and vegetable debris. *E. hirtipes* has also been taken in the nests of *F. obscuripes* by Bruner. It appears, therefore, that all the myrmecophilous Cetoniinæ have a predilection for ants of the genus *Formica* or of the allied genus *Plagiolepis*, which represents *Formica* in South Africa. That this predilection is exhibited by so many genera of the subfamily and in such widely separated regions as South Africa, Europe and North America, shows that it must be of very ancient origin.

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NEW SPECIES OF NOCTUIDÆ FOR 1908. I. WITH NOTES ON CHARADRA, RAPHAIA AND PSEUDANARTA.

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CHARADRA Wlk.

There are now five species in our fauna which seem properly referable to this genus, and these may be distinguished as follows:

Secondaries white or whitish, more or less infuscated outwardly.

Primaries with median lines connected by a more or less obvious line; t. a. line with an outward dentation at its middle.

Orbicular conspicuously black centered.

Primaries smooth, even dark gray, without strong contrasts; secondaries almost uniformly white.....*ingenua*.

Primaries whitish, black powdered, contrastingly marked; secondaries a little stained, especially in female, and outwardly darker.

deridens.

Orbicular not conspicuously black centered; maculation not strongly contrasting, secondaries of ♀ dusky throughout.....*sudena*.

Primaries with median lines not connected; t. a. line upright, without an outward dentation at middle.....*dispulsa*.

Secondaries yellow at base, with a determinate outer black marginal band.....*patens*.

Ingenua Sm., is the largest of these species and is from Colorado. The smooth, even, glistening gray primaries distinguish it readily, and the black markings are not conspicuously contrasting.

Deridens Gn., is the common species, ranging from Canada to Florida and west to the Mississippi. The ground color of the primaries is white with a slight creamy tinge and on this the markings are laid in black or bluish powderings, sometimes covering the wing very completely; but always leaving a considerable portion of the ground color exposed in contrast. The lines of maculation are usually intensely black, and the round black orbicular is usually one of the conspicuous features of the wing; but it is rarely brown rather than black, especially in old or worn examples. The connection between the ordinary lines is always obvious and usually conspicuous and the upper part of the median shade joins this connection, giving the effect of a frame with light filling, centered by the orbicular.

Sudena Sm., is a dull, smaller reproduction of *deridens* and may not really be specifically distinct. It is from Miami, Florida, and as a whole is less contrastingly marked than the preceding, the darker portions more like washings than powderings. The orbicular is hardly darker than ground and the lines are narrow and scarcely contrasting.

Dispulsa Morr., is chiefly from Texas and is a very light ashen gray species with rather scattering blackish powderings. The lines are narrow, black, and there is no longitudinal connection between them.

Trisuloides patens Druce, is a *Charadra* which I had named *basiflava* before Dr. Barnes called my attention to the figure in the *Biologia* (II, 509, pl. 96). It has been taken at Palmerlee, Cochise Co., Arizona, and is no doubt a member of our fauna.

Decora Morr., and *illudens* Wlk., are hardly congeneric with the preceding.

***Charadra sudena*, new species.**

In all essential details of maculation like *deridens* Gn. It differs in its smaller size in both sexes, in the narrower, much less contrasting transverse lines and it lacks the conspicuous black center to the orbicular. The bar connecting the median lines is narrow, brown or altogether wanting, and the s. t. line is much less irregular.

Expands, 1.36–1.44 inches = 34–36 mm.

Habitat. — Miami, Florida.

Two males and one female from Dr. Barnes; all of them a little discolored, but otherwise in good condition.

RAPHIA Hbn.

In 1903 I separated out the species of this genus with material then in hand, and concluded that *R. coloradensis* and *R. pallula* represented good species, and that another which I named *cinderella* was rightfully entitled to a name. Recently, in looking over Dr. Barnes' magnificent collection he called my attention to a series of six examples of yet another form, differing from all the others. His material bears out fully my conclusions of 1903, and he was good enough to let me have a series of his examples so that now I have before me sufficient material to demonstrate the differences sharply. As they stand now in the collection their distinctness is so obvious that I have no hesitation in expressing my confidence in their validity. Curiously enough four of the species occur at Denver, and they show a much closer relationship between *coloradensis* and *abrupta* than between the former and *frater*, with which it has been usually associated. In fact *frater* varies scarcely at all, specimens from all parts of its range being practically alike.

In tabular form I make the separation as follows :

Secondaries smoky in both sexes.....*abrupta*.

Secondaries white in both sexes.

Ordinary spots large, completely outlined ; reniform approximately kidney-shaped.

Primaries uniformly very dark gray, wings not blotched, maculation not contrasting.....*frater*.

Primaries powdery gray over a white base, more or less tinged or blotched with luteous ; inferior half of basal space blacked powdered.

coloradensis.

Ordinary spots greatly reduced and not completely outlined ; reniform either reduced to an upright dusky filling or, if marked, then narrow, upright, not kidney-shaped.

Very even pale gray, coarsely powdered, veins conspicuously blackish, giving a rayed appearance ; s. t. line scarcely traceable.....*elbea*.

Blotched with luteous, less evenly powdered ; reniform reduced to an upright dusky shade which is sometimes divided into two black spots.

pallula.

Very even, pale ash gray ; veins not blackish ; s. t. line distinct ; reniform dusky.....*cinderella*.

Abrupta Grt., differs from all species in the infuscated secondaries, and when there is a series under examination the species stands out very clearly. The primaries are rather uniform dull ashen gray, not so roughly powdered as some of the other species, and while all the maculation is well written it is not conspicuous nor contrasting. It seems

to be the least common of the species, albeit widely distributed, the specimens before me coming from Illinois, Colorado and Texas. It has been also recorded from Canada and thus has a range that will probably carry it to the Rocky Mountain chain.

Frater Grt., is the most common of the species. It is also the darkest in color and always recognizable by the contrast between the very dark steel gray primaries and the white secondaries. The maculation is in black, and the lines are as a rule clearly written. There is more or less black powdering and in some specimens a tendency to darken the lower half of the median space. In the material before me are specimens from Ontario, Winnipeg, Cartwright, Manitoba, Aweme, British Columbia, Connecticut, New Jersey, New Hampshire, Illinois, Iowa and Colorado. Texas has been included in the record, so that this is probably the most widespread as well as the most abundant of our species.

Coloradensis Cram., is nearer like *abrupta* than like *frater* in maculation, but has white secondaries, while the primaries are more or less blotched with yellow and powdered with black. There is a distinct tendency to darken the lower half of the median space, and some examples are very contrastingly marked. All my examples are from Colorado ; Denver and Fort Collins being the specific localities represented.

Elbea Sm., is a very characteristic species which, because of the black powdering along the veins and the reduction of the transverse lines, has a peculiar rayed or strigate appearance. The ordinary spots are much reduced and the reniform is narrow, upright and scarcely defined. All the examples are from Deming, New Mexico.

Pallula Hy. Edw., looks, at first sight, like an intensified *coloradensis*, but it is still more blotchy, more coarsely and irregularly powdered, while the reniform is not outlined at all and only the dark filling remains. Even this is reduced in some specimens so that only a little black powdering remains to indicate the inferior angle, while in other cases two black spots mark its upper as well as lower portions. Denver, Colorado, and Phoenix, Arizona, are the localities represented in my collection.

Cinderella Sm., is a dull powdery gray form, but very pale, very even and the powderings not black nor contrasting. The ordinary lines are not well marked and while almost everything is present, there are no really black markings at all. The s. t. line is really the

most conspicuous feature of the wing, in contrast to the other species where the opposite is rather the rule. My specimens are from Los Angeles.

***Raphia elbea*, new species.**

Ground color whitish, with an irregularly disposed mottling of luteous and with coarse blackish powderings giving it an ash-gray appearance. Head yellow in front, vertex blackish. Collar black lined and black tipped. Patagia yellowish, powdery, with a dark gray submarginal line. Disc of thorax gray, powdery, posteriorly tipped with blackish. Abdomen gray, powdery, the tufts black mottled. Primaries with all the maculation obscured by the coarse powderings, no two examples being alike in the amount of powderings or yellow mottling. Basal line sometimes indicated by black costal spots. T. a. line geminate, sometimes complete, sometimes upper half only distinct, sometimes nearly all lost; usually the outer part of line best marked and black; in course it is outcurved with a little outward tooth at middle into the claviform. T. p. line single, linear, shaped as in its allies, sometimes followed by pale scales giving an obscurely geminate appearance. S. t. line altogether wanting or present as a diffuse irregular pale shading through the darker exterior area. A series of distinct black terminal lunules between the black marked veins, this blackish marking sufficiently conspicuous to give the wings a somewhat strigate appearance. There is a dusky blotch on costa, indicating the inception of a median shade, and below the claviform is a dark cloud across the median space. Orbicular small, round, outlined in gray, yellowish. Reniform scarcely defined, upright, narrow, yellowish, with exterior border more or less black powdered. Claviform large, extending as usual across the median space and more or less yellowish tinted. Secondaries white, with scant black powderings outwardly, grouped into a diffuse, vague blotch at the anal angle, and a series of very distinct black interspaceal terminal lunules. Beneath white, more or less black powdered; with a small discal lunule on all wings and, in some specimens, an indicated common outer line.

Expands, ♂ 1.20-1.28 inches = 30-32 mm.: ♀ 1.40-1.48 inches = 35-37 mm.

Habitat. — Deming, New Mexico, July 8-15.

Three males and three females, all in good condition, from Dr. Barnes. The males are uniformly and decidedly smaller in this series of specimens; but that may not be universally true. As a rule, however, the males throughout this genus average smaller than the females.

***Acronycta tonitra*, new species.**

Head, thorax and abdomen a soft smoky gray. Orbits of the eyes white, breast whitish, legs more or less smoky gray. Primaries soft smoky gray, a white shade preceding the t. p. line and extending inward into the median space more or less. T. a. line outwardly oblique, very obscure, sometimes barely traceable, marked by an oblique costal shade, usually also by a little V-shaped mark below the cell, from which a line of black scales may be traced to the base; a few white scales sometimes indicate the course of the line. T. p. line well removed outwardly, nearly parallel with outer margin, strongly dentate in the interspaces, more or less marked with black scales and preceded by a white shade which may be obscure or well-marked, linear,

or inwardly diffuse so as to lighten a part of the median space. The fringes are paler gray, outwardly tipped with white and narrowly cut with gray on the veins. Orbicular small, oval, concolorous, more or less obviously outlined in black. Reniform oval, obscure, more or less darkened by a blackish median shade which extends obliquely from the costa to the reniform and is rarely traceable below that point. Secondaries very pale smoky gray, tending to whitish. Beneath smoky gray, varying in tint, with a dusky discal spot on all wings and an indicated common extra-median line.

Expands 1.40-1.64 inches = 35-41 mm.

Habitat. — St. Louis, Missouri, June 9, July 21, August 12, 21, 23, Mr. H. McElhose.

Altogether unlike any other of our species by the soft smoky color and the strongly denticulated outer line. From the single female in my collection I had taken it to be *similana* of which I had only males from Chicago. Mr. A. Kwiat, however, who had both sexes of *similana* received also both sexes of the St. Louis species from Mr. McElhose, demonstrating their specific difference at once. *Similana* as appears now, from better material, is more ashen gray, powdery, although the lines are much the same in course. Above the anal angle the black line is more distinct in *tonitru* and traceable across the t. p. line. Two males and five females are under examination as co-types. One pair in my collection, the others with Messrs. Kwiat and McElhose, the specific name being a suggestion from Mr. Kwiat.

Noctua bairdii, new species.

Pale gray, a little lustrous. Head concolorous. Collar, basal one third black, contrasting. Thorax powdered with black atoms. Abdomen more yellowish, dull, not lustrous. Primaries powdered with blackish atoms which are somewhat more dense outwardly and toward the inner margin. Basal line single, broken, blackish, a little diffuse. T. a. line incomplete, marked by a blackish spot on costa and traceable as a diffuse, broken band to the sub-median interspace. T. p. line marked by a black spot on costa, then continued as a brown, thick, denticulated line which is not much relieved against the light ground: in course it bends widely from costa over reniform and is almost evenly oblique below that point. There is a vague dusky median shade, well marked on the costal area; but lost beyond the cell. S. t. line a diffuse brownish shade parallel with the outer margin, and hardly traceable below the middle of the wing. There is a pale line at the base of the fringes. Orbicular vaguely traceable as a moderate round spot. Reniform narrow, lunate, the sides marked by black scales. Secondaries whitish with a slight yellowish tinge, costal region apex and outer margin darker, fringes white. Beneath whitish, primaries with a smoky suffusion, both wings with a punctiform extra-median line.

Expands, 1.72 inches = 43 mm.

Habitat. — High River, Alberta, Canada.

One female example in fair condition received from Mr. Baird who collected it and after whom I have named it, through Dr. Fletcher.

There is no very near ally to this species. It belongs obviously to the *lubricans* series and stands next to *atricincta*, than which it is much larger, quite different in ground color and without the obvious transverse lines. So far as they go, however, the lines in *bairdii* correspond in position with those of *atricincta*. As I understand it, only the one example was taken.

Aplectoides abbea, new species.

Ground color whitish, more or less overlaid by mossy green and shaded with blackish brown or gray. Head whitish, overlaid with green, sometimes slightly reddish. Collar similar in color to the tip, which is edged with blackish at the base of the small, blackish marked, anterior tuft. Thorax gray with greenish overlay, patagia with black submargins; a black line at base of basal tuft. Abdomen whitish. Primaries varying in shade and amount of green overlay, all the markings distinct. Basal line geminate, black, white filled, extending to a small black basal line. T. a. line geminate, black, outer portion best defined, included space more or less white; on the whole outwardly oblique, deeply incurved on the cell to avoid the larger, irregularly ovate orbicular which is black ringed, the black inwardly edged with white scales, concolorous or paler. Claviform moderate or small, narrow, outlined in black, concolorous. Reniform large, kidney-shaped, varying somewhat in width, black ringed, narrowly annulate with white, inferiorly a little dusky. A black bar connects the ordinary spots inferiorly. T. p. line geminate, inner line more distinct, black, lunulate, outer even, not so well marked, included space paler than ground; outwardly bent from costa over cell, then very even, almost parallel with outer margin. S. t. line sinuate, of the ground color, preceded by a darker shading which tends to form black sagittate marks in the interspaces, just below costa and opposite the cell. A series of black interspaceal terminal lunules. Secondaries dirty white with a faint yellowish tinge; a discal lunule, an extra-median line and a subterminal shade band being obscurely indicated. There is a broken, brown, terminal line. Beneath whitish, more or less powdery outwardly and along the costal margins; all wings with an extra-median dusky shade line and a smoky discal spot.

Expands, 1.60-1.72 inches = 40-43 mm.

Habitat.—Westminster, B. C.

Three females in good condition from Dr. Barnes. The species is intermediate between the eastern *pressa* and *prasina* in size and, while at first sight it resembles a small *prasina*, the details of the maculation are much nearer to those of *pressa*, which it does not greatly resemble. I have associated it generically with *pressa* rather than *prasina*; but it is quite probable that eventually all the forms must be placed together in one generic group.

Chorizagrotis boretha, new species.

Ground color dull smoky red-brown. Head concolorous or a little paler. Collar inferiorly pale, like the costal region of primaries; this pale portion limited above by a transverse black line. Thorax of the ground color, disc tending to become a little paler; primaries with costal region more or less contrastingly paler, tending to yellowish; ordinary spots also discolored, yellowish. Cell black-filled before and between the macula; a black mark below median vein in basal space. Basal line geminate, black, marked on costa and where it cuts the basal streak with its pale filling. T. a. line geminate, black, with pale included space, incomplete, marked on costa and by an excurved mark in the sub-median interspace. T. p. line geminate, the outer portion tending to become lost, the inner lunulate, abruptly bent outward below costa, then almost parallel with outer margin. S. t. line a little sinuate, of the ground color, marked by the darker color of terminal space except at apex where it is defined by a dusky preceding shade; also preceded by a series of sagittate black marks in the interspaces. A series of small black terminal lunules and a yellow line at base of fringes. Claviform moderate in size, concolorous, pointed, black margined. Orbicular moderate in size, a little oblique, tending to ovate, yellowish, contrasting. Reniform large, kidney-shaped, incompletely black margined, yellow with a smoky central line, top and bottom tending to become infuscated. Secondaries smoky whitish at base, becoming darker outwardly; a smoky discal lunule; fringes whitish. Beneath whitish, more or less powdery, all wings with a discal spot, primaries with an indicated outer line.

Expands, 1.40-1.48 inches = 35-37 mm.

Habitat.—Kaslo, B. C., August and September, Mr. Cockle.

Three males and one female, none of them very good, but altogether demonstrating a distinct species allied to *terrealis* Grote. From the latter species the discolorous ordinary spots separate it at once, the general details of maculation being otherwise much the same. The single female is much more powdery in appearance than any of the males, but this may not be a uniform feature. In a general way the species has the appearance of *perexcellens*, the antennal structure, however, being quite different.

Chorizagrotis sordida, new species.

Ground color dull sordid brown, more or less shaded with black or smoky. Head concolorous. Collar concolorous, with a black median line. Thorax uniform, of the ground color. Primaries with a black diffuse streak through basal space below median vein, interrupted by the basal transverse line. Cell more or less darker or even blackish before and between the ordinary spots, but not solid black-filled. Basal line geminate, black, included space pale, usually broken and best marked on costa and through the black streak. T. a. line geminate, black, included space pale, a little outwardly oblique and slightly excurved in the interspaces. T. p. line geminate, the outer portion lost beyond the costal region, the inner blackish, lunulate, very even, almost parallel with outer margin. S. t. line a little sinuate, concolorous, marked by a dusky preceding shade on the costa and by a series of black, sagittate interspaceal

marks; below the apex also by a slight darkening of the terminal space. There is a pale line at the base of the fringes. Claviform narrow, pointed, extending almost to the middle of the median space. Orbicular small, round, or ovate, ringed with yellowish. Reniform large, kidney-shaped, edged with black and usually incomplete above and below; with an inner ring of yellow scales and the center of the spot more or less yellowish and discolored. Secondaries dull yellowish white at base, darkening to a broad smoky border, fringes white. Beneath whitish, powdery, all wings with a discal spot, primaries with disc more or less smoky and sometimes with an indicated outer line.

Expands, 1.44-1.56 inches = 36-39 mm.

Habitat. — Kaslo, B. C., September 6, Mr. Cockle.

1 ♂ and 5 ♀, in fair or good condition. This is a peculiarly sordid looking form with the depressed body of the majority of the species, but the maculation more like that of some of the species of *Euxoa* of the *ochrogaster* series. It differs from *boretha* in the flattened appearance and in the concolorous orbicular, costa and collar. It varies in the amount of blackish overlay in the median space, one example being almost purplish black.

***Porosagrotis delorata*, new species.**

Ground color dull luteous gray, with a greenish tinge. Head with a black line between the antennæ. Collar black powdered, with a black transverse line. Thorax black powdered, the patagia not well marked in the specimen. Primaries with all the maculation well defined, none of it conspicuously contrasting. Basal line geminate, blackish, almost upright, extending into the sub-median interspace. T. a. line upright from costa to vein one, then with a long outward bend to the inner margin; geminate, outer portion black, inner brown, included space a little paler than the ground. T. p. line geminate, inner portion lunulate, blackish, outer even, less marked, included space a little paler; in course with a slight, very even outcurve over cell, and an even less obvious incurve below. S. t. line pale, a little irregular, with distinct outward dentations on veins 3 and 4, preceded by black, more or less sagittate marks. There is a series of black terminal lunules. The surface of the wing is very finely black powdered, and where this powdering is absent as on the veins and between the median lines, the appearance is as of a paler marking. The claviform is broad, extends almost to the middle of the cell and is filled with blackish powderings. It does not extend basad of the t. a. line and is not in any way connected with the base. The cell is a little more densely powdered before and between the ordinary spots. Orbicular large, nearly round, concolorous, with a pale annulus. Reniform large, incompletely defined, extends a little beyond the borders of the cell, blotched with blackish. The terminal space is a little darker than the remainder of the wing. Secondaries smoky at base, blackish outwardly, fringes whitish. Beneath whitish, lustrous, disc of primaries darker.

Expands, 1.46 inches = 36 mm.

Habitat. — High River, Alberta, Canada.

A single good male collected by Mr. Baird and sent in by Dr. Fletcher. The specimen has moderately pectinated antennæ and the branches are bristle-tufted at the tips. It is related in general type of maculation to *orthogonia* Morr., but differs in the darker ground color of the primaries in which the greenish tint is obvious, and in the smoky secondaries, which in *orthogonia* are almost white in the male. It is unfortunate that the female is not at hand; but only the single example was taken.

PSEUDANARTA Grt.

In looking over his collection, Dr. Barnes also called my attention to the species of *Pseudanarta* which, in his opinion, were getting mixed — *i. e.*, specimens were being referred under names which did not really cover them. He was good enough also to turn over some of this incongruous material to me and this I have combined and closely compared with my own.

There are five nominal species in our catalogues: *aurea* Grt., *flava* Grt., *singula* Grt., *flavidens* Grt., and *falcata* Neum., and of these, *flava* is the generic type. I called attention to the fact that *aurea* was not congeneric with the other species, in 1892, after examining the type in the British Museum, and it is probable that this species is the type of *Copanarta* Grt., Abh. nat. Ver. Brem., XIV, 112, cited as a synonym of *Pseudanarta* by Dyar; but I do not have the publication for reference. Later, when describing *Oncocnemis nigerrima* in the Journ. N. Y. Ent. Soc., 1903, I referred to it as a close ally of *aurea* Grt., which I placed in the same genus; whether wisely or not is perhaps a question. At all events *aurea* with its abbreviated, armed fore-tibia cannot remain associated with *flava*, which has the same member long, slender and unarmed.

P. falcata Neum. differs from all the other members of the genus in wing form and in the divergent more hairy thoracic vestiture, and its stay in this genus will probably be limited.

This leaves three species, all described by Mr. Grote, and fully congeneric. *Flava*, the first described and also the smallest has an ash-gray base upon which the maculation is somewhat inconspicuously marked. There is a distinct connecting bar between the median lines and above that the median space is more or less brownish, a color that is also evident in the s. t. space. The t. p. line is exserted over the cell and has the angles of the exsertion a little marked, sometimes emphasized when the line is a little drawn in just opposite

the middle of the cell. *Crocea* Hy. Edw. was referred to by Mr. Grote as barely a variety of his species, but Hampson recently recognized it as distinct.

Singula is larger and darker with the maculation much better defined and black; the black bar connecting the median lines is conspicuous, but there is no brown shading above it. The course of the t. p. line is much as in *flava*, except that the angle of the lower part of the exsertion is much more obvious, and an oblique shade composed of short black dashes extends through the s. t. space almost to the apex. The color of the secondaries is also deeper, more orange than yellow and, altogether, this is a very good species.

Flavidens differs obviously from both the preceding by the very even t. p. line which is roundedly exserted over the cell and very deeply incurved below it, so that it narrows the median space which is not crossed longitudinally by a conspicuous bar; but it is crossed transversely by a conspicuous black shade which passes between the ordinary spots, and below the cell is close to or in actual contact with the t. p. line.

Out of the material separated from the specimens that agree fully with the described species I have separated three series, two representing forms that seem to be undescribed and these are here characterized as follows, while I have re-characterized *crocea* Hy. Edw., which is really a very good species and not a variety or synonym.

Pseudanarta dupla, new species.

Ground color dark chocolate brown. Head and thorax with gray scales intermixed, giving a somewhat hoary appearance which tips the collar and the edges of the patagia; the latter with a submarginal blackish line. Basal line geminate, black, traceable almost all the way across the wing. T. a. line geminate, outer portion black, inner obscure, intervening space white powdered; in course outwardly oblique, with an outward angle on the sub costa, a more prominent one in the sub-median interspace, and a smaller, more acute tooth below the sub-median. T. p. line geminate, inner line black, distinct, outer brown, obscure, included space white; in course squarely exserted over the reniform, forming a distinct angle on vein 5, thence very evenly oblique to the hind margin except where it is a little drawn in to meet the black bar which extends through the median space from the middle angulation of the t. a. line. The median space above the bar is more obviously brown than elsewhere in the wing. Orbicular large, oblique, concolorous, narrowly outlined by white scales. Reniform large, kidney-shaped, slightly darker, narrowly outlined by white scales. S. t. line whitish, a little irregular, outwardly edged by black scales in the dusky terminal space; as a whole almost parallel in course with the t. p. line, so that the s. t. space which is paler than the rest of the wing, is remarkably uniform in width throughout. The fringes are broad, brown at base, paler

outwardly, cut with pale beyond the veins. Secondaries pale orange with a broad, black, sharply defined black outer margin, the inner edge of which is a little drawn in opposite the cell and in the sub-median interspace, while it forms an outward dent on vein 1. Beneath, both wings yellow with a broad blackish outer border. The primaries are much powdered with blackish, have no discal spot and the outer black border is limited inwardly by a transverse line. The secondaries have a small black discal spot and the black border is a duplicate of that of the upper side.

Expands, .94 inch = 23-24 mm.

Habitat.—Stockton, Utah, September 18; South Park, Colorado.

Two males in fair condition; the Utah example from Mr. Tom Spalding, the other from Mr. David Bruce. The latter has passed as *flava* in my collection for nearly twenty years and yet it is really nearer to *singula*. Its more striking superficial characters are the very even, pale s. t. space and the uneven black border of the secondaries, which are not found in any other species. On the under side the primaries have no discal spot while that in *flava* is conspicuous; *flavidens* has none, but on the upper side *flavidens* has the terminal space concolorous while in *dupla* it is distinctly darker.

Although found at widely different localities and fully fifteen years apart in time, the two examples before me are almost identical.

***Pseudanarata crocea* Hy. Edw.**

Ground color gray. Head a little darker, uniform. Thorax ashen gray, with an intermingling of darker scales; no distinct markings. Primaries without any brown shading, all the maculation black and gray. Basal line geminate, black with a wide outward angle in the cell. T. a. line geminate, black, included space whitish powdered, widely outcurved as a whole, with moderate outcurves in the interspaces. T. p. line geminate, inner line black, lunulate, outer brown, even, included space white, evenly outcurved over cell, without angles, only a little incurved below. S. t. line irregularly sinuate, preceded by a series of black marks in the s. t. space and followed by a more or less well marked black shading. There is a crenulate white terminal line and the long fringes are cut with pale on the veins. The s. t. space except where the blackish spots mark the s. t. line is powdered with gray and this extends almost to the apex. Orbicular narrow, oblong, very oblique, white ringed and obscurely pale powdered. Reniform large, kidney-shaped whitish marked. Both spots somewhat confused by a gray shade which lightens the upper part of the median space and appears like a gray blotch. There is a slightly darker shade, but no obvious cross bar between median lines. Secondaries pale orange with a broad, black marginal band, the inner edge of which is sharply defined and very even. Beneath, both wings yellow at base and with a broad outer black marginal band; neither with a discal spot; primaries much paler than secondaries.

Expands, .92-.96 inch = 23-24 mm.

Habitat.—Colorado: Salida in July, Durango, Glenwood Springs in September; Utah: Stockton in September; Arizona: Yavapai County in September.

Four males and three females; of these the Arizona ♀ is from Mr. Otto Buchholz; the Utah female is from Mr. Tom Spalding; one Salida male is of my own capture; the others are from Dr. Barnes.

This species differs from all the others in the absence of discal spots on the underside, in the very sharply defined edges to the black border and in fact that on primaries the margin of the border is oblique from costa to inner margin so that the black is of a triangular form. It is also the only species in which there is a black edging before the s. t. line. This series of specimens was separated out as differing obviously from *flava* and was not recognized as Mr. Edwards' species until I compared the types in the American Museum. The distinctive characters are here brought out more clearly.

***Pseudanarta actura*, new species.**

Ground color dull, fuscous brown. Head and thorax concolorous; abdomen more gray, yellowish at base. Primaries very dull and obscurely marked, the only conspicuous feature of the wing being the white blotch above the anal angle. Basal line geminate, obscure, scarcely traceable in most specimens. T. a. line geminate, black, the outer portion broader and more distinct, very oblique and a little excurved. T. p. line geminate, inner line black, outer brown, included space gray, in course squarely exerted over reniform, making a moderate angle on vein 5, whence it runs with a slight incurve to inner margin. S. t. space marked with gray and brown, forming the palest part of the wing and lightening to a white blotch just above the inner margin. S. t. line pale, a little sinuate, more or less obscured, marked by the darker terminal space. A broad, blackish, broken line at base of fringes. The ordinary spots are very obscure, concolorous and faintly defined by a ring of whitish scales. Orbicular oval, oblique. Reniform moderate, kidney-shaped. An obscure blackish bar connects the median lines. Secondaries pale yellowish, with a broad black outer border, the inner edge of which tends to become a little irregular. Beneath, primaries so heavily powdered as to seem almost blackish throughout, yet basally this is over a yellow ground which shows better in the male. On the secondaries there is less powdering, the outer band is broad, and there is a distinct discal dot.

Expands, .80-.96 inch = 20-24 mm.

Habitat. — Deming, New Mexico, September; Wilgus, Cochise County, Arizona.

Two males and four females; all in good or fair condition and all from Dr. Barnes. This is the darkest and most obscurely marked of all the species and also the smallest in average size. A single female measures 24 mm., but this is 2 mm. greater than any other example in the series. It does not seem possible to mistake this for any other species and none were included with any of the older species in my collection.

Perigea latens, new species.

Dull, luteous gray; the females with a reddish tinge; more or less powdery; all the maculation broken. Head and thorax concolorous, patagia tending to a blackish, powdery, sub-marginal line. Primaries with all the maculation traceable and none of it distinct or complete; the darker filled reniform being the most conspicuous feature. Basal line geminate, black, broken, outcurved, extending to the sub-median vein. T. a. line geminate, blackish, broken, only a little outcurved as a whole and between the veins. T. p. line geminate, blackish, tending to become reduced to venular spots below the costal region; rather abruptly bent outwardly and then very even, parallel with outer margin. A fairly defined smoky median shade crosses between the ordinary spots. S. t. line is pale, irregular, more or less emphasized by yellow scales, preceded by a somewhat darker shade and the terminal space variable but tending to paler. There is a narrow, broken, black terminal line followed by a yellow line at the base of the interlined fringes. Claviform wanting or barely indicated in the male; always indicated but never quite complete in the female. Orbicular small, round or nearly so, black ringed, concolorous or slightly paler. Reniform moderate in size, kidney-shaped, dusky. Secondaries whitish, translucent at base, becoming smoky outwardly, the fringes white. Veins and a small discal spot smoky. Beneath gray, powdery, secondaries paler, both wings with an extra-median transverse line and a small discal spot.

Expands, 1.00-1.10 inches = 25-27 mm.

Habitat. — San Diego Co., Calif., V, 28; VI, 10, 21; IX, 16; Yuma Co., Arizona in March.

Three males and three females, all save one ♀ collected by Mr. W. S. Wright for Mr. Frank A. Merrick, the odd female from Arizona collected by Mr. Hutson. As a whole the females are a little broader winged and perhaps a little better marked than the males; but there is little difference. The males have the antennæ very shortly pectinated; in the females they are simple. In general form and habitus this is an ally of *perplexa* Grt.

Caradrina costiplaga, new species.

Ground color a pale creamy luteous — lighter in the flown specimens, more reddish and powdery in fresh examples. Head and thorax concolorous, sides of palpi brown. Primaries with a conspicuous triangular, blackish or brown patch on costa just beyond the middle. Its outer edge reaches the inception of the t. p. line, it extends downward to include the reniform and its inner edge on costa is at just about the middle of that margin. T. a. line single, usually marked by a small costal spot only, sometimes traceable by brown scales in an angulated oblique course across the wing. T. p. line punctiform, evenly outcurved, the dots small, blackish and venular, easily lost in flown specimens. A series of contiguous black terminal lunules basing the dusky fringes. Secondaries dusty gray, with an obscure dark discal lunule and a smoky terminal line. Beneath, primaries very pale luteous with costal patch of upper surface showing through, secondaries white, with faint discal spot.

Expands, .75-.90 inch = 19-22 mm.

Habitat. — Yuma and Yavapai Cos., Arizona in June; Yavapai Co., in August; Baboquivaria Mts., Pima Co., July 15-30; Southern Arizona, Sept. 15-30.

Three males and three females, all more or less flown. Three examples were taken by Mr. Hutson, each at a different time and date; the others are from Mr. O. C. Poling, two of them through Mr. F. A. Merrick. The species is an ally of *conviva* and even smaller and more frail. As it is quite probable that Sir George Hampson will divide the present assemblage in our lists under *Caradrina* no differential characters need be pointed out here.

***Homohadena rayata*, new species.**

Clear ashen gray, more or less shaded with deep brown. Head brown. Collar pale gray with a transverse black line near base. Thorax black powdered, with a broad dark brown band behind the collar. Primaries powdered with blackish or dark brown scales which darken the outer portion; costal area whitish. A longitudinal streak extends from base to the t. p. line and this is broad and diffuse through the basal area, narrowing to a point at the t. p. line. A similar streak extends through the cell from t. a. line outwardly to the outer margin; broadest and diffuse in the median space, narrowing to a point at the margin. All the veins are more or less obviously marked with dark scales. From the outer margin interspaceal black streaks extend inwardly almost to the t. p. line and these are more or less edged with whitish at the point where the s. t. line might be normally expected. No trace of a basal line in the specimens. T. a. line slender, black, continuous, preceded by a whitish line, very oblique and widely outcurved, an inward tooth on sub-median interspace where the longitudinal line crosses, and a slight outcurve below. T. p. line black, slender, continuous, followed by a white line, with a long outcurve over cell and a somewhat more shallow incurve below, a little inward tooth at the point where the longitudinal streak reaches the line. The orbicular is lost in the black streak through cell and the reniform is marked only by a small extension above and below the streak. Secondaries smoky, a little more whitish at base, with white fringes. Beneath whitish, powdery; primaries more smoky on disc, with an indicated transverse line at outer fourth of wing; secondaries powdery along the costa, with discal spot and a very irregular transverse line a little within the outer margin.

Expands, 1.18 inches = 29-30 mm.

Habitat. — Kerrville, Texas.

Two female specimens from Dr. Barnes. The species is allied to *badistriga* but is smaller; the median lines more slender; the interspaceal marks longer and heavier; the secondaries more evenly smoky in the female; without trace of coppery brown shading. It is probable also that the male will be found to have dusky secondaries. As to form this is a slighter insect than *badistriga* and the abdomen of the female is much longer and more obtusely terminated.

Homohadena dinalda, new species.

Dark ashen gray with a slight brownish tinge. Head chocolate brown. Collar brown at extreme base below a black line above which it is very pale gray or whitish. Thorax concolorous or a little gray powdery. Abdomen paler gray. Primaries very little powdery. A prominent, rather well defined black streak extends beneath the median vein from base to t. p. line. A similar streak extends from reniform outward to the s. t. line. Basal line single, black, marked across the costal region only. T. a. line single, black, incomplete, partially lost and very slender in the middle of its course, well marked on the margins, it forms a well defined obtuse outward angle in the cell, a less defined inward angulation on the longitudinal streak and a slight out-curve below this. T. p. line single, black, irregular in thickness, widely outcurved over the cell and deeply incurved in the sub-median interspace, followed by a slightly paler or whitish shading. S. t. line consists of a series of whitish interspaceal blotches which tend to become lost. A series of black terminal lunules. A pale line at the base of the fringes. Orbicular not traceable in the specimens. Reniform very obscurely marked, its form not defined in the material before me. Secondaries smoky, paler at base, with a brown terminal line; fringes more whitish, showing through from beneath is a smoky discal spot and a slightly irregular extra-median line and discal spot; secondaries with a very distinct extra-median line and an obvious discal spot.

Expands, 1.25 inches = 31 mm.

Habitat.—Winnipeg, Manitoba, July 19; Sandy Lake, Newfoundland, August 15.

One male in good condition one female somewhat rubbed and broken. These two examples, widely separated in locality and 10 years in date of capture are, I believe correctly associated, and represent a species allied to *retroversa* and *infixa* in the smoky secondaries and to *badistriga* in the maculation of primaries. It is quite possible that it may be found in collections mixed with *badistriga* which has white secondaries in the male and black streaks in the interspaces toward the outer margin. From *infixa* and *retroversa* it differs in its smaller size and in the almost total loss of its ordinary spots.

Oncocnemis lacticollis, new species.

Ashen gray, powdery. Head and collar creamy, yellowish; palpi gray at sides, head with a black inter-antennal line. Thoracic disc powdery. Abdomen paler gray not powdery. Primaries powdery without transverse lines or ordinary spots; veins black marked; a series of terminal interspaceal black streaks; fringes concolorous. Secondaries yellowish gray at base, darkening to smoky brown outwardly; fringes whitish with a smoky line near base. Beneath, uniform powdery gray, body paler, more yellowish.

Expands, 1 inch = 25 mm.

Habitat. — Stockton, Utah, September 4.

This is a very simply marked form, easily recognizable by the

creamy head and collar, combined with the intensely black line between the antennæ. The type is a female in good condition from Mr. Tom Spalding and is the only example known to me.

***Tæniocampa mecrona*, new species.**

Ground color dull creamy gray with scarcely a trace of red or brown. Head and thorax concolorous, immaculate; abdomen a little more smoky. Primaries with all the maculation obscure, no color contrasts and no well defined lines or spots. Basal line geminate, blackish, broken, traceable in all the specimens. T. a. line well removed from base, rather even, outwardly oblique with a slight outcurve; geminate, but the inner line lost or barely traceable in most examples, while the outer may be broken, a mere scattering of scales, or a rather broad diffuse fascia which is never so dark as to be conspicuous. T. p. line geminate, very evenly outcurved over the cell; less distinctly so below; the outer portion of line punctiform, tending to become lost. S. t. line pale, marked by a slightly darker preceding, powdery shade, very even, almost parallel with the outer margin. A series of small, obscure, interspaceal, terminal marks. Orbicular round, small or moderate in size, concolorous or a little paler, not dark ringed. Reniform very obscure, upright, small, a little constricted centrally, usually traceable by paler scales. Secondaries dull, even, smoky in both sexes. Beneath whitish, more or less powdery; primaries often smoky on disc, sometimes with an extra-median darker line; secondaries paler, powdery along costa, with an extra-median line and discal spot.

Expands, 1-1.15 inches = 25-29 mm.

Habitat. — Kaslo, British Columbia, in early July.

A series of 2 ♂♂ and 6 ♀♀ from Mr. J. W. Cockle who called my attention to the fact that it differed from *T. communis* Dyar, with which it may be confused in collections. Of *communis* I have 14 ♂♂ and 9 ♀♀ before me and, comparing them as grouped, the new species differs obviously in the gray color, lacking all red or brown, while the secondaries are uniformly smoky without yellowish tinge or lustrous appearance. On the whole it is also larger than *communis*, all the females running larger than any male, while in the female *communis* at hand most of the specimens are smaller than the average male and none equal the largest of that sex. A single specimen may not attract attention when mixed with *communis* but, once separated out and compared as series, the differences are obvious.

***Leucania calpota*, new species.**

Ground color brownish ochreous. Palpi brown at sides. Collar with three narrow lines of metallic dark gray. Center of thoracic disc more or less metallic gray, usually marked only on the posterior tuft. These scales are easily lost and are completely present only in fresh examples. The primaries have the usual strigate appearance; the veins a little paler, a darker line each side and a dusky line through the middle of the interspace. There is a dusky shade over and below the median

vein and which extends a little beyond it, tending to connect with a more obscure, triangular, subapical shading. There is a white dot at the end of the median vein. A series of small black interspaceal dots marks the s. t. line. The fringes are dusky and there is a series of terminal black venular points. Secondaries dirty yellowish white, the veins darker and the outer margin dusky. Beneath quite uniform dull pale yellowish; primaries tending to become smoky on disc; secondaries paler, more diaphanous, costal area powdery.

Expands, 1.40-1.52 inches = 35-38 mm.

Habitat. — Harris County, Texas, no date; collector unknown.

Fifteen males and three females mostly in at least fair condition. The species resembles a dusky *phragmatidicola* and was mistaken for it until the mounted series showed that the secondaries were uniformly yellowish rather than white and that the color of primaries throughout was deeper, more like that of *juncicola*, which was sent in with this new form. But the color differences are not the only one separating this species from *phragmatidicola*. In the male the tuftings of legs and abdomen, while of the same type are much less marked and the outer spur of the middle tibia instead of being curved and flattened is very much abbreviated and has a cylindrical short, acute point. The species would belong to the genus *Cirphis* of Hampson.

Stylopoda anxia, new species.

Head, thorax and primaries dull smoky brown, almost black; abdomen and secondaries deeper, more blackish brown, with a bronzed reflection. Maculation of primaries reduced to an obvious s. t. line which is squarely exerted over the cell, white powdered beyond an edging of black scales at that point, deeply incurved below cell and there broader, conspicuously white. In one example a few white scales indicate an upright t. a. line and in two of the examples there is just sufficient difference in shade between the s. t. and terminal spaces, to indicate an irregular s. t. line. The ordinary spots are vaguely indicated by black scales and a slightly paler preceding ring, in one example also by a deepening tint between the spots. Secondaries immaculate. Beneath black with an incomplete median white fascia, which is better marked on the secondaries.

Expands, .67-.72 inch = 17-18 mm.

Habitat. — Fort Wingate, New Mexico, VII, 21, 31; VIII, 3; collector unknown.

Two males and one female, all flown specimen, not in the best of condition; but so characteristic that I have not hesitated to describe.

Parora snowi, new species.

Ground color a rather pale luteous, tending to grayish. Head and thorax uniform in color; abdomen a little paler. Primaries powdered with brown atoms over the entire surface, and more or less with black scales below an oblique line which extends from the end of the median vein to the apex. T. a. line single, brown,

powdery, outwardly bent so as to form almost a right angle at the middle of its course; the angle rounded. Median shade single, brown, well marked, from the middle of costa oblique to the end of the median vein, there acutely bent and inwardly oblique to the middle of inner margin. As the oblique line from apex terminates at the point of angulation, some specimens have an apparently continuous shade line from the apex to the middle of the inner margin. T. p. line single, narrow, brown, outwardly oblique from costa to the point where it reaches the subapical line and then acutely bent and inwardly oblique to the inner margin. S. t. line brown, powdery, rivulous, more or less broken; as a whole parallel to the outer margin. A scalloped terminal line emphasized by blackish terminal venular dots. Ordinary spots often wanting; orbicular, when present, brown, punctiform; reniform small, brown, annular, with concolorous center. Secondaries a somewhat brighter yellowish; sometimes with a median shade line obscurely indicated. Beneath, yellowish; primaries with disc a little smoky.

Expands, .75-.93 inch = 19-23 mm.

Habitat. — Brownsville, Texas, in June.

Five males and four females in fair to good condition. All the males and one of the females came from Prof. F. H. Snow and are dated; three females are from the Esper Ranch, without date, and are out of the collection of the Brooklyn Institute. I have reason to believe that there are other examples in collections.

In the simplest marked of the examples all the lines and the oblique subapical streak are neatly and lightly written in brown, the streak being most obvious and somewhat diffuse inferiorly. The dusky shading tends to increase and in the opposite extreme a blackish brown powdering covers almost the entire area beyond the line drawn from apex to middle of inner margin. All the males are smaller than any of the females.

***Yrias pardalis*, new species.**

Dull smoky dark brown, more or less obviously washed with a blue tinge. Head and collar slightly darker than the rest of the body, else all concolorous. Both pairs of wings are similar in color and the transverse maculation extends over both pairs. T. a. line geminate on primaries, the included space somewhat paler, component parts equally well marked, in course forming a distinct outward tooth at its middle. On secondaries it is more even and single. A median somewhat diffuse but well marked shade crosses before the middle of primaries and at basal third of secondaries. Two other, less obvious, somewhat rivulous dark lines cross the median space before t. p. line, the outer tending to become prominent and black toward inner margin of primaries and across secondaries. T. p. line geminate, the inner portion most prominent and black from costa half way across primaries; then both lines become similar, more diffuse and across secondaries they are well separated. S. t. line more or less diffuse, followed by a reddish shade. A conspicuous black spot at apex just beyond s. t. line, but not quite reaching the tip of wing. A rivulous black

terminal line. A yellow and then a black line on fringes, beyond which they are gray, cut with brown. Beneath uniform smoky brown.

Expands, 1.00-1.16 inches = 25-29 mm.

Habitat. — Santa Rita Mts., Arizona, 5,000-8,000 feet, in June ; F. H. Snow.

Two males and two females in good condition from Prof. Snow. The species is allied to *clientis* in the position of the black apical spot ; but it is smaller, the vestiture is rough, the maculation much more obvious and diffuse, the s. t. line on secondaries is much more prominent and courses of all the lines differ obviously when compared. The smaller size, rougher vestiture and more conspicuous markings are the easily recognizable features.

EASTERN AND CENTRAL EUPITHECIAS.

RICHARD F. PEARSALL,

BROOKLYN, N. Y.

With our *Eupithecias*, especially the eastern forms, there has heretofore been no systematic attempt to separate the species. In an effort to do so my first aim was to gather material in large quantity and to separate it into species, regardless of name. Following this the application of names of described species to some of the forms required long study and patient discrimination, and while some problems remain unsolved, the long series of commoner forms in my own collection serve to establish these names beyond any doubt in my own mind. Even the elusive *miserulata* has been ferreted out by this method. The result leaves a number of forms, which cannot be included under the old names, and some of them are described in this paper ; others still remain in abeyance, represented by single examples whose status will not be clear until better specimens are at hand.

Eupithecia mutata, new species.

Expanse 19 mm. Palpi long, rather heavy, dark brownish, tipped with white. Antennæ in ♂ flattened, strongly ciliate, in ♀ flattened, almost simple. Head and thorax dark brownish gray. Wings whitish leaden, shaded with dark gray or dark brown and rust-red scales, the latter forming a band across fore wings, within basal area, which is frequently wanting or replaced by a leaden gray band, and another, always present with more or less distinctness just outside extradiscal geminate pale line. Basal line fine, of black scales, near to origin of wing, turning sharply outward at

costa, thence curving inward to base of wing at inner margin and having at subcostal an outward point. This line is often absent, and is followed by a broad dusky or rust-red band, outside which runs a geminate pale line, similar to that outside extradiscal, starting onethird out from costa, extending toward discal dot, then rounding at right angle, running across wing, slightly turning toward base, and generally with an outward point at vein one. The outer boundary of this line, which becomes the discal line, is narrowly shaded with black in discal space, except at costa where it becomes heavy and broad, filling the angle above geminate line but not enveloping the discal dots as in *albicapitata*. Discal space darkened costally by dark gray scales, or in highly colored examples by dark red-brown. Extra discal line black, two thirds out, crossing to subcostal in straight line, with a small outward curve at vein seven, and another larger rounded sweep opposite cell beneath which, after a slight curve toward base, it proceeds straight across to inner margin. This line is continuous, not broken into dots as in *ablicapitata*, heavily shaded with black at costa and within discal space, and having points of black inwardly at veins. Beyond this the usual pale geminate line runs parallel to it, succeeded by the broad reddish band, which is outwardly limited by the well defined, subterminal whitish line, strongly waved between veins, angulate toward costa. Subterminal space dark gray. Fringes long, heavy, pale gray to dusky, faintly clouded at end of veins. Terminal line black, distinct, widely cut, with white between veins. Discal dots large, oval, jet black, oblique. Hind wings in color same as fore wings, black within basal line. Between this and extradiscal are two dusky straight lines, the first of which includes discal dot, which is small, somewhat obscure, linear, and nearer base of wing than usual. Extradiscal leaves costa with broad outward scallop, rounds cell with a second larger sweep, turns sharply and runs straight to inner margin nearly two thirds out, with a wide shading of black or dusky scales along internal edge. The geminate, pale lines follow it externally, with a narrow dusky shade line beyond these, which is outwardly bordered with the angulate, whitish, subterminal line, as on fore wings. Subterminal space and fringes paler. Terminal line as on fore wings. Beneath silvery gray, with dusky lines reproducing those above, the extradiscal, and broad shade line, following the geminate pale lines, being especially marked, as also the subterminal space at apex. Terminal line as above, fringes paler. Discal dots on fore wings large, black, lineate or oval on hind wings, crescentic, heaviest above, running to a point below, turned outward. Abdomen above dark gray, with a mixture of white and brownish scales. Second segment bright reddish chestnut; beneath whitish, paler at tip. Body and legs silvery gray, the latter with fore tibiae and all tarsi heavily marbled and ringed with dark brown.

Type. — ♂ and ♀ taken in Big Indian Valley, Catskill Mts., N. Y., the former June 22, 1905, the latter July, 3, 1906, and eight cotypes in author's collection.

This species has caused not a little confusion. In size and shape it resembles *latipennis*, and a specimen he received from Mr. Hanham, was placed by Dr. Hulst, as the type of that species, in the collection of the Brooklyn Institute Museum. Later, when the true type of *latipennis* was discovered in the Hulst collection at New Brunswick,

it was, for the sake of designation called *albicapitata* Pack., and while its markings and colors resemble that species in size it is fully one third larger. In none of my examples are the discal spots merged with the costal blotch, and the extra discal in *albicapitata* runs straight from costa around cell where it breaks into dots. The latter is a rare species but I have five good examples for comparison. The type ♂ is rather highly colored, and the ♀ nearly normal in that respect. I have placed it under *Eupithecia*, but four of my examples have the double accessory cell characteristic of *Eucymatoge*, yet in the majority it is single, in one instance two in one wing and one in the other. In coloration it comes near to *Eucymatoge togata*, the European type of the genus, but through the kindness of Mr. L. B. Trout, I have received six examples of that rather rare species, and I find that, while superficially the resemblance is great, the arrangement of colors is different, and there seems to be a constant feature in the course of extra discal line below cell. In *mutata* it runs direct to inner margin, while in *togata* there is in all my specimens, a sharp inward angle at vein one, with a tendency toward union with discal line along this vein. I surmise that a highly colored example of *mutata* has caused Mr. Taylor in his recent List of British Columbia Lepidoptera, to include *togata* therein.

***Eupithecia intimata*, new species.**

Expanse 18 mm. Palpi long, of dark and pale gray scales, mixed. Front, vertex, thorax and abdomen above clothed with same, the latter having a ring of soiled white at base. All rings above a uniform pale ashen gray. A number of narrow wavy darker shade lines cross fore wing, from base to intradiscal line, which is broad and dusky at costa, where it turns toward discal dot, fading rapidly and becoming narrow as it proceeds in waved line, straight to inner margin. Above discal dot, which is linear and jet black, there is a broad pale space on costa, which, extending across wing, fills the discal space and is traversed centrally by one or two very narrow, waved dusky lines hardly discernible. This space is bounded outwardly by the dusky, extradiscal shade line, which starts from a dark spot at costa, rounds outward opposite cell, thence inclining toward base, reaches inner margin in two broad waves, having inward points on veins 1 and 2. The usual parallel pale line succeeds this outwardly and is not very distinctly marked. Subterminal space very slightly darkened, the white central line, usually present, is discernible only in a few pale scales, chiefly at apex and at anal angle. Hind wings hardly paler than fore wings. All the lines, faint at inner margin, fade out centrally, and the pale line preceding subterminal space is traceable only by a darkening of this space. A cluster of dark gray scales at anal angle. Discal dots faint, linear. Terminal lines on all wings dark gray, not clearly defined; fringes ash-gray, cut with dark gray at veins. Beneath dusky ashen, the pale discal space and line reproduced as above on fore

wings, while on hind wings, the diffuse, faint, dusky, basal extradiscal and subterminal rounded lines are clearly traceable across wing. Within basal line the wing is dusky, clearer beyond, with discal dots on all wings faint, linear. Body beneath silvery white, the legs and abdomen beneath with a sprinkling of gray scales, the latter somewhat darker at tip.

Types. — ♂ and ♀ taken by Mr. Wm. Beutenmüller in the Black Mts., N. C., on August 12 and July 24, 1906, respectively, are in the collection of the Am. Mus. of Nat. History. The ♂ is in poor condition, but was so designated in order to establish its structural characters — the ♀ being perfect.

This species is near to *conformata* Pears., but is larger, the male antennæ are heavier and more strongly ciliate, the wings longer, and more produced at apices. The discal dots are linear, and farther out from base, and the markings less distinct.

***Eupithecia affinata*, new species.**

Expanse 13 mm. Palpi very short, barely visible beyond the front, jet black, tipped with cinereous. Fore wings sharper at apices, otherwise much resembling *coagulata* Gueuse, with color above including front, vertex, thorax and abdomen, a uniform cinereous, darkest along costa and subterminally. A dusky band crosses thorax in front, and the second segment of abdomen is jet black. Four costal blotches are the beginning of faint broken lines of black scales across fore wings, the two jet black central ones on either side of the discal dot quadrate and larger. Basal area small, blackened, outlined sharply outward at costa, retreating toward base at inner margin. Intradiscal faint, apparently running straight across wing, with slight outward curve at costa. Extradiscal from costal blotch outward to vein six, then angled sharply and inclined toward base, runs straight to inner margin, followed by parallel pale line which is outwardly defined by the darkened subterminal shade only. This is traversed by a fine, faint, wavy, continuous pale line, running nearer to outer margin than usual. Terminal line black, broken between veins. Fringe on all wings ashen, darker at ends of veins. Discal dots jet black, round, rather large. Hind wings with lines from base to extradiscal, showing only at inner margin, the latter being shadowy but continuous across wing, ring outward at cell and nearly parallel to outer margin. This is succeeded by the broad pale line defined outwardly by a shadowy subterminal line, rather more clearly than in fore wings. Discal dots smaller than on fore wings but distinct. Beneath dusky ashen, the intra- and extradiscal lines repeated more definitely than above, on both wings, the latter especially, which has at costa a large black blotch. The succeeding pale line, broad and distinct on both wings, is followed by a dusky shade line darkened at costa. Discal dots as above but fainter. Body beneath, and abdomen for half its length beneath silvery white, tip darker. Legs missing. Antennæ rather heavy for size, flattened, well ciliated.

Type. — ♀ in author's collection, taken at New Brighton, Pa., August 15, 1907, received through the kindness of Mr. F. A. Merrick.

This species could be readily mistaken for a small *coagulata* but the round discal dots, short palpi, and sharper wing at once distinguish it.

Eupithecia cimicifugata, new species.

Expanse 18-19 mm. Palpi moderate, stout, loosely scaled. Fore wings broad, rounded at apices and on outer margin, much as in *latipennis*. Hind wings with margin flattened between veins two and six. Vertex soiled white; front, thorax and wings a soft gray inclining to a faint glossy bronze in some examples, due to the presence of intermingled metallic coppery scales. No black markings. On fore wings the lines are of dark brown scales which also form obscure clusters along costa, the heaviest being just beyond discal dot, at inception of extradiscal line. All lines diffuse shadowy; the basal appears to leave costa with a slight outward curve, thence straight to inner margin. Extradiscal rounds outward about cell with a very slight angle near costa, then with basal inclination reaches inner margin, two thirds out, much after the pattern of *palpata*. Following it, the usual geminate pale line has its central dividing line broader than usual. A dark shade line beyond this is outwardly defined by the whitish, slightly waved, but continuous subterminal line, between which and margin the wing is paler. Terminal line dark brown, diffuse, broken between veins, and seems to cover the fringe basally, except at ends of veins, where it is cut with whitish scales. Terminally the fringe is pale silky gray. Discal dots small, dark brown, barely visible in some examples. Hind wings with no definite markings. The pale geminate line, with its bordering of darker scales running parallel with outer margin, can be traced faintly. Discal dots as on fore wings, but minute. Beneath soiled white, with subterminal shade line and extradiscal line on all wings well defined, leaving the broad pale line very conspicuous. Within the extradiscal to base, the wing is dusted with dark brown scales, which sometimes gather into a faint basal line, and always become thin about discal points, causing these to appear more prominent than above and somewhat linear. Abdomen above silvery gray at base, the second segment a rich chestnut-brown with a slight coppery tinge, terminally dark brown, mixed with gray scales, the segments dusky white anteriorly. Beneath white, the tip sooty brown. Body beneath, and legs soiled grayish white.

Type. — ♀ No. 11880, U. S. Nat. Museum, bears label thus: "Larvæ bore in fruit racemes of Black Snakeroot (*Cimicifuga racemosa*). Cabin John, Maryland, issued June 15, 1900." Type ♂ in author's collection, taken by Mr. H. D. Merrick, New Brighton, Pa., August 31, 1904. Cotypes: two ♀♀ in author's collection and one ♀ with Mr. L. W. Swett, Malden, Mass., all captured in Pennsylvania.

The range of color in this species has given me some trouble. The type ♀ is more gray than examples seen later, and as the above are all I have been able to assemble, it must be of rare occurrence.

Eupithecia cocoata, new species.

Expanse 22 mm. Palpi long, rough, scaled. Antennæ flattened, rather stout, ciliate. Head and entire upper surface of body and wings a uniform chocolate-brown, the costa barred with paler streaks, which are beginnings of narrow, pale, indefinite, wavy lines across fore wings. The most prominent of these are from a twin spot, turning outward and enclosing discal dot, and running thence in a broad wave straight to inner margin. The pale line usually succeeding extradiscal is also present, geminate across costa, then coalescing and becoming indistinct, curved strongly outward at costa, not angled; inclined basally with a large curve between veins one and two, it reaches inner margin three fourths out. The white line usually traversing subterminal space is absent, showing only in a cluster of pale scales at anal angle. Discal dots moderately large, oval, jet black, outwardly bordered with a few white scales. Fringes on all wings same color as upper surface, slightly darkened opposite veins. Terminal line dark chocolate-brown, interrupted between veins. Hind wings showing continuance of pale line succeeding extradiscal, otherwise unmarked except along inner margin, where they are shortly barred with dark brown, and at anal angle, where scattering dark brown scales are contiguous to a conspicuous white lunate spot. Discal dots round, small, dark brown. Beneath whitish, thickly sprinkled with brown scales, showing a discal, extradiscal and broad subterminal shade lines, in darker tints, all heavier at costa. The pale lines as indicated above, also clearer white. The hind wings basally are crossed with narrow wavy pale lines, and the subterminal shade line is blackened at anal angle. Discal dots as above, but all dark brown. Abdomen beneath with white scales. Fore legs dark brown, the tarsi banded with paler. Middle and hind legs whitish.

Type. — One ♂ in U. S. Nat. Museum, taken at Plummer's Island, Maryland, probably in June.

This species differs from *meritata* Pear. in color, in the absence of black lines or veinings, in its stouter, more heavily ciliate antennæ and longer palpi.

NEW WESTERN TENTHREDINIDÆ.*

By S. A. ROHWER,

BOULDER, COLO.

1. *Bactroceros pugnax*, new species.

Female. — Length 9.5 mm.; length of anterior wing 8 mm. Robust. Head almost as wide as thorax, polished, without punctures; face not very strongly margined and not as perpendicular as in *Bactroceros luteicornis* Nort.; posterior angles of head rounded; clypeus rounded at sides, rather truncate across middle; middle carina extending on basal half of clypeus; middle carina divides above antennæ

* The writer wishes to express his thanks to Prof. C. P. Gillette and Mr. H. S. Smith for the loan of material and to Prof. T. D. A. Cockerell for many favors. Unless otherwise stated, the types are in the author's collection.

forming two low, rounded carinæ; ocellar basin distinct, the lower walls being the branches of the middle carina; lateral ocelli smaller than the anterior one; ocelli forming a triangle. From each antennal fovea there is a broad furrow running upward to about the level of lateral ocelli. Left mandible tridentate, second tooth small, obtuse. Eyes prominent, almost round. Antennæ 26-jointed, rather short, third joint as long as four plus five. Thorax above shining, without punctures, pleure and pectus with a few rather small punctures; pronotum with a few rather long yellowish hairs. Venation as in *Bactrocera depressus* (Proc. U. S. Nat. Mus., xxix, Fig. 41), except that the second radial cell is not so acute at apex above. Tarsal claws deeply cleft, inner tooth somewhat shorter than outer; four hind tibiæ with a pair of spurs about one fourth from the apex and a single spur near the middle. Abdomen polished, venter with some rather short rufous hairs. Color shining black; clypeus, mandibles except tips, which are piceous, palpi, spot on lower half of cheeks, four small spots across front on an imaginary line drawn almost across between the eyes about the middle, two elongate spots on vertex back of ocelli, a line from middle of inner orbits to occiput (this line is wider at the occiput), tegulæ, small spot on posterior angle of pronotum, four anterior legs (the tibiæ and tarsi are somewhat reddish) and posterior femora *yellow*. Abdomen entirely and posterior tibiæ and tarsi *rufous*; coxæ and trochanters black. Wings hyaline, with a very faint yellowish tinge; nervures and stigma black.

Habitat. — Russell, Costilla Co., Colo., June 25, 1907 (L. Bruner). Type in the entomological collection of the University of Nebraska. Tightly held by the mandibles is the leg of some other insect.

This species differs from most species of the genus *Bactrocera* in having the head polished and the front not very strongly margined. In these characters it seems to come near *Liolyda* but differs from that genus in the intercostal nervure, etc. It seems to be most closely related to *pallimacula* Nort. and *rufocinctus* Cress. but may be separated from these species at once by the almost entirely black thorax and other characters.

2. *Lycaota bruneri*, new species.

Female. — Length 5 mm. Head narrower than thorax; clypeus slightly emarginate; labrum rounded; mandibles simple; malar space almost wanting; middle fovea very large, shallow; ocellar basin distinct, walls rounded, middle of lower wall notched. Antennæ as usual for the genus, third joint almost as long as four plus five, last six joints subequal. Transverse radial nervure received in apical fourth of cell; stigma broad at base tapering to apex; tarsal claws simple; sheath broad, of about equal width throughout, truncated. Color black; apex of mandibles rufous; labrum piceous; tegulæ, posterior angle of pronotum, two ventral segments of the abdomen, *pale brown*; legs clear reddish; coxæ, trochanters, basal third of four anterior femora black; basal third of tibiæ pallid; tarsi infuscated. Wings hyaline, nervures and stigma brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft., June 27, 1907 (L. Bruner).

This species has its closest ally in *Lycaota nova* Nort. (Maine), but may be distinguished by the more rufous legs, different structure of head, antennæ, etc. I do not think that it is the female of *L. lenis* Cress.

3. *Camponiscus smithi*, new species.

Female. — Length 7.5 mm.; length of anterior wing about 7.5 mm. Head not quite as wide as thorax, a little wider behind eyes; clypeus deeply circularly emarginate, lobes broad, obtusely pointed; labrum rounded at apex; middle fovea rather shallow, broad, walls sloping; frontal crest strong, slightly broken in the middle; ocellar basin distinct, rather sharply pointed above, walls somewhat rounded. Furrow on anterior lobe of mesonotum distinct and extending the entire length. Claws deeply notched, teeth stout, subequal. Intercostal vein a little beyond basal; basal vein joining subcostal about its own length basal to the origin of the cubitus; first recurrent nervure short, not quite parallel with basal; transverse median in middle of cell; stigma large, broadest near base, tapering to apex; from second recurrent nervure to about middle of third cubital on cubitus is an extra nervure; lower discal cell of hind wing exceeding upper on outer margin. Sheath broad, rounded on lower margin, a brush of hairs at apex; cerci long, slightly tapering. Color reddish-yellow; clypeus, labrum, base of mandibles (the apex piccous), posterior angles of pronotum and tegulæ somewhat pallid; antennæ above, small spot around ocelli, a very small spot above each antenna, eyes (ocelli brownish), two spots on lateral lobes of mesonotum, suture between scutellum and lobes of mesonotum, post-scutellum, metanotum, middle of basal plates, sutures of metapleuræ, extreme bases of posterior coxæ, apex of first and second tergal segment, base of sheath *black* or *brownish*. Wings slightly yellowish hyaline, costa and stigma yellowish hyaline, rest of nervures brownish.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft., July 1, 1907 (H. S. Smith).

Closely related to *C. americanus* Marl., but separated by characters given below. Type in the Univ. of Nebraska.

4. *Camponiscus albstigmus*, new species.

Female. — Length 7 mm.; length of anterior wing 6.5 mm. Not as robust as *smithi*. Head not as wide as thorax, well developed behind eyes; clypeus very slightly emarginate, almost truncated; labrum slightly notched at apex; middle carina strong, rounded below antennæ; middle fovea shallow, walls sloping; frontal crest strongly notched in middle; ocellar basin with walls rounded; antennal joints enlarged at apex, third joint longest; middle furrow of anterior lobe of mesonotum distinct, running the entire length. Claws bifid, teeth subequal. Intercostal vein about its length beyond basal; basal vein not its length basal to origin of cubitus, but more than half of it; first recurrent as in *C. smithi* Roh.; transverse median a little beyond middle of cell; upper discal cell of hind wings exceeding lower on

outer margin; stigma broad, not strongly tapering. Sheath broad at base, lower margin tapering to apex; cerci long, very slightly tapering. Color reddish-yellow; clypeus, labrum, mandibles (the apices are piceous), cheeks below eyes and tegulæ in part, white; two basal and part of third antennal joints above, eyes, ocelli, spot on lateral lobes of mesonotum, suture between scutellum and mesonotum, metanotum, postscutellum, middle of basal plates, base of posterior coxæ, a spot above and sheath above, *black*; base of ventral and tergal segments brownish; sheath with long hairs. Wings hyaline, iridescent; costa and stigma white, nervures pale brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft., July 2, 1907 (L. Bruner). Type in the Entomological Department of the Univ. of Nebraska.

This species does not seem to be closely related to the other American species.

It was quite a surprise to find these two new species of *Camponiscus* in a lot of Tenthredinidæ sent me by Mr. H. S. Smith, of the University of Nebraska. There is but one other species of the genus known from North America (*C. americanus* Marl., Can. Ent., p. 251, October, 1896) and it is from New York and New Hampshire. This is an excellent example of how little we know of our saw-fly fauna! I give below a table with which to separate the American species of this genus:

1. Clypeus very shallowly emarginate; frontal crest strongly broken; stigma and costa white; antennæ reddish yellow..... *albostigmus*, new species.
Clypeus deeply emarginate; frontal crest not or but slightly broken; stigma yellowish hyaline; antennæ dark above.....2
 2. Middle fovea deep; scutellum in part black; meso-epimera and femora infuscated; no black spots on mesonotum.....*americanus* Marl.
Middle fovea shallow; no black on scutellum; meso-epimera and femora not infuscated; two dark spots on lateral lobes of mesonotum...*smithi*, new species.
5. *Pteronus costillensis*, new species.

Female. — Length 5.5 mm.; length of anterior wing 5.5 mm. Not very robust. Head not as wide as thorax; labrum rounded at apex; clypeus very shallowly emarginate, lobes broad, rounded; middle fovea circular, rather deep; antennal joints three, four and five equal; ocellar basin distinct, lateral walls running to lateral ocelli; lower wall broader and rounder than lateral walls; frontal crest somewhat curved anteriorly, slightly broken. Claws deeply notched, teeth equal. Venation normal; stigma broadest at base, tapering to apex. Sheath broad, slightly obliquely truncated at apex, hairs on apex small; cerci rather long, not noticeably tapering. Color reddish-yellow, somewhat darker on vertex and dorsulum; ocelli, eyes and abdomen somewhat *black* above; antennæ a little darker above; clypeus, labrum, mandibles (apex piceous) and coxæ *pallid*. Wings hyaline, iridescent; costa and stigma very pale yellowish brown, rest of nervures darker.

Habitat. — Sierra Blanca, Costilla Co., Colo., 10,000–11,500 ft.,

June 22, 1907 (L. Bruner). Type in collection of Nebraska University.

This species is most closely related to *P. unicolor* Marl. (Calif.) but may be separated by the differently shaped clypeus, and the stigma which is not acuminate and unicolorous and is darker. It also bears resemblance to *P. mendicus* Walsh but may be distinguished by the deeper middle fovea, and the frontal crest which is not strongly broken and is much paler in color. It may be *monochroma* Nort. but the pleuræ are not darker than the rest of the body. The type of *monochroma* is lost.

6. *Pontania utensis*, new species.

Female. — Length 4.5 mm.; length of anterior wing 4.5 mm. Robust, head nearly as wide as thorax, rather densely covered with fine punctures; clypeus moderately, deeply and circularly emarginate; lobes broadly rounded. Third antennal joint a little the longest, joints gradually decreasing in length; middle fovea distinct, circular; frontal crest not broken, rather strongly projecting, tooth like; ocellar basin indistinct, lower wall nearly, or quite obsolete, lateral walls low, rounded, subparallel. Mesonotum not as densely punctured as head, the furrow of middle lobe extending about half way across; venation normal, except that the basal vein is rather strongly bent at base. Claws deeply notched, teeth subequal, well separated. Sheath broad, slightly excavated below, obtusely rounded at apex; cerci rather short, stout. Color black, clypeus, labrum, mandibles (apex piceous), cheeks and face below eyes, posterior angles of pronotum, tegulæ pallid; legs from apical part of coxæ reddish yellow; femora beneath sometimes infuscated; posterior and superior orbits dark rufous. Wings hyaline, iridescent; costa at base, stigma at base and in middle pallid; rest of nervures pale brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft. Two ♀♀ June 22, 1907 (R. W. Dawson), one ♀ July 1, 1907 (R. W. Dawson), one ♀ June 22, 1907 (L. Bruner). Cotypes in collection of Univ. of Nebraska and in the author's own collection.

Separated from *excavata* Marl. its nearest ally by the different frontal crest, teeth of claws subequal and well separated, second recurrent nervure not, or not nearly interstitial with second transverse cubitus, antennæ not lighter beneath, etc.

7. *Pteronius solitarius*, new species.

Female. — Length 7 mm. Head viewed from the side shows the vertex much higher than eyes, slanting from the front (not so strongly as in *Pteronius odoratus* Dyar); eyes oval; ocellar basin large, well defined by narrow raised walls, the two side walls running to lateral ocelli, thus being parallel or sub-parallel; middle fovea deep, triangular; antennal foveæ deep, pointed above the antennæ. Antennæ slender, long, tapering, third and fourth joints equal, last two joints equal. Clypeus angularly emarginate, lobes broad, pointed. Venation of hind wings about normal;

the upper discal exceeds the lower considerably, the petiole of lanceolate cell is rather longer than usual; fore wings wanting. Claws deeply and evenly notched. Sheath broad, obtusely pointed; cerci stout, rather short. Color reddish yellow; antennæ, eyes, large spot from base of antennæ above to occiput, mesonotum, scutellum, metanotum, basal plates, abdomen above, not so widely at the apex, sheath, hind tibiæ and tarsi, small spot under tegulæ, two small spots on meso-pectus *black*; four anterior tarsi somewhat infuscated. Wings hyaline, nervures brown.

Habitat. — Trinidad, Colo., May 14, 1892 (C. P. Gillette), "general collecting." Type in collection of Colorado Agricultural College.

This species was labeled "*Enura s-nodus* Walsh," which it is not. If it is an *Enura* it can be known from *E. s-nodus* by black posterior tibiæ and tarsi. Although the fore wings are not present I feel sure it is a *Pteronous*. It may be separated by the following character from its allies.

1. Clypeus broadly, circularly emarginate2
 Clypeus angularly emarginate.....3
2. Frontal crest broken by a narrow line; hind femora at apex resinous
 cornelli Marl.
 Frontal crest unbroken; hind femora at apex black.....*ostryæ* Marl.
3. Ocellar basin triangular; no black on pectus.....*odoratus* Dyar.
 Ocellar basin quadrate, sides sub-parallel; two black spots on pectus
 solitarius, new species.

8. *Pachynematus robustiformis*, new species.

Female. — Length 6 mm.; length of anterior wing 6 mm. Robust. Head a little wider behind compound eyes, rather closely punctured; ocellar basin broad, walls linear, not well defined above; lower wall broader and rounded; middle fovea circular, rather large, deep; frontal crest very slightly broken; antennal foveæ rather large, sloping; clypeus shallowly, circularly emarginate; antennal joints three, four and five subequal. Intercostal vein its length basal to basal; stigma broad, rounded, widest across the middle. Inner tooth of claw small, a little basal to middle. Sheath broad, upper margin straight, lower margin tapering, apex truncate; cerci short, robust. Color black; labrum, mandibles (apex rufo-piceous), posterior angles of pronotum, tegulæ, extreme apices of coxæ, trochanters, four anterior femora, tibiæ and tarsi, posterior tibiæ except apex *pallid*; posterior femora brownish; bases of four anterior tibiæ infuscated; tip of posterior tibiæ and tarsi black; venter of abdomen more or less luteous. Wings hyaline, iridescent; nervures, costa and stigma brown.

Habitat. — Sierra Blanca, Costilla Co., Colo., 10,000–11,500 ft., June 22, 1907 (L. Bruner); also Ute Creek, Costilla Co., Colo., 9,000 ft., July 24, 1907 (H. S. Smith).

This species falls next to *robustus* Marl. It may be known from that species by the stigma being widest in the middle, the different position of the intercostal nervure, the short cerci, etc. The head

does not widen strongly behind the eyes. There may be a little obscurity in this part of Marlatt's table. Taking it as the head narrower behind it runs to *palliventris* Cress., from which it may be known by the vertex not being tuberculate, the third antennal joint not the longest, the tergum entirely black, etc.

9. *Pristiphora dawsoni*, new species.

Female. — Length 7 mm.; length of anterior wings about 7 mm. Robust; head not as wide as thorax, densely and moderately coarsely punctured; clypeus truncate; middle fovea distinct, circular; frontal crest strongly projecting, slightly broken; lateral walls of ocellar basin faintly visible; antennal foveæ deep, somewhat pointed above; third, fourth and fifth antennal joints subequal. Middle furrow of anterior lobe of mesonotum distinct for anterior two thirds; thorax not nearly as strongly punctured as head. Venation normal; inner tooth of claw large, obtuse, near middle of claw. Sheath broad, rounded on lower margin to apex, upper margin straight; cerci short, robust. Color black; apical margin of clypeus, labrum, mandibles (apex piceous), angles of pronotum, tegulæ, apical segment of abdomen, apices of coxæ, trochanters, basal two thirds of hind tibiæ pallid; anterior legs, except line on femora beneath, reddish-yellow; posterior femora brownish; apex of posterior tibiæ and tarsi black. Wings hyaline, iridescent, nervures and stigma brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft., July 4, 1907 (R. W. Dawson).

Related to *banksi* Marl. and *bucoda* Kincaid. It may be separated from *banksi* by the distinct large tooth of claw, pale pronotum, larger size, etc. From *bucoda* Kincaid it may be known by the black venter, costa and stigma being brownish, pronotum in part pale, different shaped sheath, etc. Type in the collection of University of Nebraska.

10. *Pristiphora maura*, new species.

Male. — Length 5 mm.; length of anterior wing 4.5 mm. Robust; head not as wide as thorax, rather sparsely covered with punctures, vertex rounded; clypeus truncate; middle fovea almost wanting; frontal crest shallowly excavated; no trace of ridges around ocelli; antennal foveæ deep, rounded above; middle furrow of middle lobe of mesonotum replaced by a carina. Thorax not as markedly punctured as head. Inner tooth of claw near middle, rather small, obtusely pointed. Venation normal, except that the first transverse cubitus is wanting; stigma rounded on lower margin, a little the widest across middle; procidentia small. Color black; apex of mandibles piceous; tips of anterior femora, four anterior tibiæ and tarsi, basal two thirds of posterior tibiæ ferruginous. Wings hyaline, iridescent; nervures, costa and stigma brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9,000 ft., July 4, 1907 (R. W. Dawson). Type in collection of the University of Nebraska.

This species runs to *siskiyouensis* Marl. (Calif.) in Marlatt's

"Revision of the Nematinæ of N. Am." It may be known from that species by the narrower head, third antennal joint not much longer than fourth, middle tibiæ and tarsi ferruginous, etc. From the habitat it would seem to be the male of *dawsoni*, but it differs so much that I do not think it can belong to this species.

11. *Emphytus leucostoma*, new species.

Male. — Length 6 mm.; length of anterior wing 5 mm. Slender; head about as wide as thorax, smooth, shining; vertex without furrows; ocellar region somewhat raised; third antennal joint a little longer than fourth, apical four joints equal, somewhat rounded beneath; malar space very narrow; clypeus broadly, deeply emarginate, lobes somewhat truncated; labrum rounded at apex. Thorax shining. Claws simple. Transverse radial near third transverse cubitus; transverse median in about middle of cell; cross-nervure of lanceolate cell but slightly oblique; hind wings without discal cells; lanceolate cell shortly petiolate at apex. Abdomen as usual. Color black; clypeus, labrum, mandibles (apex rufous), posterior angles of pronotum, tegulæ, spot on pleuræ before intermediate coxæ, four anterior legs, posterior legs to tibiæ, venter (the apex is yellowish) *white*; four anterior tarsi and posterior femora somewhat infuscated; posterior tibiæ and tarsi strongly infuscated; tergal segments two and following with a ferruginous spot in middle of apical margin and narrow apical margin. Wings dusky hyaline, iridescent; nervures, costa and stigma except base which is pallid dark brown.

Habitat. — Ute Creek, Costilla Co., Colo., 9000 ft., July 4, 1907 (R. W. Dawson). Type in the entomological collection of the University of Nebraska.

This pretty little species may be separated from its allies as follows:

1. Abdomen black, not marked; clypeus black.....*inornatus* Say.
Abdomen marked with yellowish-brown; clypeus white.....2
2. Basal joint of antennæ white; clypeus slightly emarginate.....*angustus* Kincaid.
Basal joint of antennæ black; clypeus deeply emarginate.....3
3. Claws with a large inner tooth; sinus behind ocelli; venter black at base; antennæ ferruginous beneath (east to Ill.).....*apertus* Nort.
Claws simple; no sinus behind ocelli; venter entirely pale; antennæ not pale beneath (Colo.).....*leucostomus*, new species.

12. *Taxonus lenis*, new species.

Male. — Length 6.5–7 mm. Head finely, moderately densely punctured, covered with short black hair; ocellar basin triangular, lower wall not very well defined, side walls well defined; middle fovea broad, shallow; antennal foveæ quite distinct, broader below the antennæ; antennæ rather stout, third and fourth joints equal, fifth a little shorter; clypeus deeply, squarely emarginate, lobes narrow, sharply pointed; labrum rounded at the apex; front well produced between the antennæ. Thorax not as densely punctured as the head; post-scutellum pointed posteriorly; inner spur of anterior tibiæ thicker than outer one. Claws apparently

simple; hind tibiæ as long as or a little longer than the first two tarsal joints, not as long as all the tarsal joints. Transverse radial nervure received beyond middle of third cubital (in the type it is almost interstitial with the third transverse cubitus, in the paratype it is nearer the middle of the cell); transverse median in about middle of first discoidal; radial cell of hind wing with a short appendiculation; lanceolate cell of hind wing briefly, but distinctly, petiolate at apex. Abdomen not very shining, apical segment with short hairs (these hairs are more distinct on the paratype). Color black; labrum, posterior angles of pronotum and tegulæ white; palpi flavous; apical tip of anterior coxæ beneath pallid, rest of coxæ black; femora, tibiæ, tarsi except posterior pair which are brownish, abdominal segments two, three, four and five (in the paratype the fifth segment is mostly brownish), except a band on sides, partly on venter, which is black, reddish yellow. Wings fusco-hyaline; nervures and stigma except at base which is white and the basal part of costa, which is reddish black.

Female. — Length 7 mm. Very similar to ♂ but the coxæ beneath are reddish yellow; trochanters black as in ♂; the transverse radial received in middle of third cubital; transverse median a little basal to middle of first discoidal. Sheath broad, rather truncate at apex, upper margin sharply pointed, lower apical margin rounded.

Habitat. — ♂, Horsetooth Gulch, Larimer Co., Colo., June 5, 1893 (C. P. Gillette); ♂, Ft. Collins, Colo., June 4, 1894 (C. P. Gillette); ♀, Ft. Collins, Colo., June 16, 1899. The specimen from Horsetooth Gulch, which is the type, is in the collection of the Colorado Agricultural College.

This species is related to *Parasiobla rufocinctus* Nort., but may be easily known from that species by the densely but finely punctured head and thorax; the better developed ocellar basin; the radial cell of hind wings having an appendiculation; lanceolate cell of hind wings petiolate at the apex; rufous band on the abdomen interrupted beneath; posterior angles of pronotum white; less robust stature; and many other characters.

In Dr. Ashmead's table (Can. Ent., Dec., 1898) this species runs to his genus *Aomodactium*, but the claws are simple. The placing of this species in *Taxonus* is only provisional, although it belongs with *Taxonus* according to Rev. Konow (Genera Insectorum).

13. *Rhogogaster sayi*, new species.

Female. — Length 7.5 mm. Head about as wide as thorax, not wider behind the eyes; mesial to each lateral ocellus there is a carina which runs down nearly to the antennæ where the two join leaving the lower ocellus in an elongate oval basin, open between the lateral ocelli. There is a distinct furrow outside of lateral ocelli to vertex; frontal area well defined between the antennæ; eyes nearly touching base of mandibles; clypeus deeply, squarely emarginate, lobes somewhat triangular, rounded at apex; labrum nearly as wide as clypeus, rounded at apex; apex with a few long hairs; an-

tennæ long, slender, reaching beyond base of abdomen, third joint but little longer than fourth; joints gradually decreasing in length towards apex; apex of third and the following joints covered with short, white pile. Head generally covered with small punctures. Thorax punctured like head. First joint of middle tarsi a little longer than $2 + 3$; posterior coxæ a little longer than usual but not as long as in *Macrophya*; four anterior legs covered with short white pile especially on tarsi. Intercostal vein a little proximal to the basal; lanceolate cell of fore wing with a short straight cross-nervure; second recurrent nervure wanting; lanceolate cell of hind wings shortly petiolate; upper discal cell of hind wings greatly exceeding lower on outer margin. Abdomen very minutely punctured at sides above, and two apical segments above the punctures are large and shallow; apical dorsal segment with a ridge in the middle; sheath broad, rounded at apex; apex of abdomen and sheath with rather long hairs. Color black; spot between antennæ, one between antennæ and orbit, two spots on the clypeus, labrum, cheeks, an elongate spot on each anterior corner of middle lobe of mesonotum, middle of scutellum, enchri, two spots on side of meso-epimera, a short line on one side of prothorax, middle legs except a line above and tibiæ, two lines on posterior coxæ, spot on trochanters, a band on hind femora, a more or less obscure line on side of abdomen, pallid; faint line on inner orbits extending to vertex, where it curves inward, antennæ, protibiæ and tarsi above, mesotibiæ above and mesotarsi dark rufous; hind tibiæ wanting; extreme apex of apical abdominal segment fuscous. Wings hyaline; nervures and stigma dark rufous.

Habitat. — Cameron Pass, Larimer Co., Colo., alt. about 10,300 ft., August 3, 1892 (C. P. Gillette). Type in the Colorado Agricultural College collection.

Quite distinct from all the other species assigned to this genus by Rev. Konow (*Genera Insectorum*). In coloration it resembles *Pachyprotasis nigrofasciata* but may at once be known from that species by the more distinct wall around the ocellar basin, the cross-nervure of lanceolate cell, the weaker venation, etc.

14. *Schizocerus sericeiformis*, new species.

Male. — Length about 5 mm. Cheeks very narrow; malar space wanting; clypeus truncate or nearly so, punctured across the middle; ocellar basin spear-shaped, well defined, walls somewhat rounded; medial ridge prominent; a furrow partly surrounding each lateral ocellus above; face depressed around ocelli; antennæ short, hardly reaching to scutellum, third joint bifurcate, clothed with rather long black hairs. Scutellum rounded at apex. Claws simple. Lanceolate cell broadly contracted; three cubital cells, first transverse cubital wanting; second cubital (third if first transverse cubital is present) wider on radial nervure than cubital; transverse median in middle of cell, in one wing there is an extra nervure behind transverse median. Color black, abdomen somewhat brownish; mandibles and ocelli piceous; pronotum and tegulæ luteous; apex of femora, tibiæ and tarsi (apex of posterior tibiæ and their tarsi infuscated) pallid. Wings hyaline; nervures pale brown, stigma and apex of costa a little darker, costa at base pallid.

Habitat. — Stratton, Nebraska, July 14, 1899 (collector unknown).

Type in the collection of the Colorado Agricultural College.

Related to *S. sericeus* Nort., but may be distinguished by the head and thorax being without white pile; clypeus not emarginate; mesotibiæ pale throughout, etc.

15. *Lophyrus hypomelas*, new species.

Male. — Length 5.5 mm. Head about as wide as thorax, seen from above narrowly transverse; slightly narrower behind eyes; ocelli in a curved line; lower ocellus in a narrow V-shaped basin, the walls of which are low; two somewhat indistinct furrows running from base of each antenna to near occiput; eyes remote from mandibles; between ocelli and occiput is a transverse furrow; clypeus nearly truncate; labrum rounded at apex; antennæ 18-jointed, each joint with two hairy rays beneath, the longest ones near the base. Head with fine dense punctures, deeper on malar space (the lower inner orbit is somewhat wrinkled); face and clypeus with white hair. Thorax shining, with fewer punctures than head, covered with short dull white hair. Tibial spur short, stout, sharp, simple; claws with an obtuse inner tooth between middle and apex. Costal cell wide, intercostal nervure incomplete, placed a little more than width of cell proximally to basal; basal nervure joining subcostal at origin of cubitus; first transverse cubitus incomplete; first cubital cell higher than broad; lanceolate cell nearly closed back of the straight cross-nervure; hind wings with two discal cells; lanceolate cell of hind wing petiolate at apex. Abdomen smooth, shining; apical ventral segment broadly oval, with distinct, rather sparse punctures. Color black; labrum, apex of mandibles, extreme apex of abdomen dusky reddish; venter very dark piceous; tegulæ at extreme base luteous; palpi pallid; legs except base of four posterior coxæ, and all of anterior coxæ, pale luteous. Wings clear hyaline; nervures and stigma brown.

Habitat. — Ward, Boulder Co., Colo., alt. 9,217 ft., August 30, 1899 ("O.B."). Type in the collection of Entomological Department of Colorado Agricultural College.

This species is quite distinct from any of the American species, being easily separated by the almost entirely black color and pale luteous legs.

16. *Lophyrus gillettei*, MacG. (M.S.).

Female. — Length 6.5 mm. Head nearly as wide as thorax, deeply and densely punctured, punctures on posterior orbits sparser; ocelli in a low triangle; lower ocellus in a very shallow basin; a distinct transverse furrow behind ocelli; clypeus shallowly emarginate; labrum notched in middle; malar space distinct but not as long as in *L. hypomelas* Roh.; antennæ 16-jointed, first joint of the flagellum a little longer than the others, rays about twice as long as width of joints, longest on the middle joints. Thorax above punctured like head; pleuræ and pectus smooth and shining; tibial spurs simple, short, stout; claws with an obtuse tooth in middle; costal cell broad, intercostal vein incomplete, about width of cell proximal to basal; basal vein joining subcostal a little proximal to origin of cubitus; first transverse cubitus incomplete; first cubital cell higher than broad. Abdomen with a few punctures, deeper at apex; sheath nearly concealed. Color black; mandibles except tips pale piceous;

palpi, apex of femora, tibiæ and tarsi cream-colored; apex of four posterior tibiæ and their tarsi infuscated. Wings subviolaceous; nervures brown.

Male. — Length 6.5 mm. In general resembles ♀. Antennæ 18-jointed; outer rays longer at base than apex, tapering to apex; tarsal claw-tooth not as large as in ♀; tibiæ, tarsi and palpi not infuscated; seventh ventral segment broadened at apex, roughened rather unevenly.

Habitat. — Rist Cañon, Larimer Co., Colo. (C. P. Gillette). Four ♀♀ and 5 ♂♂ raised from larvæ on *Pinus scopulorum*. Larvæ collected July 21, 1896, flies emerging October 1 to 3.

This species is easily separated from other American species by the nearly entirely black color in both sexes and other characters. The ♂ has some resemblance to *L. hypomelas* but may be easily separated by the more transverse head, shape of the seventh ventral segment, color of legs, etc.

JOURNAL

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PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MAY 21, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with nine members present and one visitor.

The proceedings of May 7 were read and approved.

Dr. Southwick read the report of the committee appointed to draft a document to be presented before the New York Academy of Sciences and its friends to commemorate the birthday of Linnæus. On motion of Mr. Bischoff the committee was discharged.

Mr. W. J. Davis of the field committee reported that an outing at Overbrook, N. J., had been arranged for Decoration Day.

Mr. Engelhardt proposed Mr. Robert P. Dow, 741 Carroll St., Brooklyn, as an active member. On motion of Mr. Roberts the by-laws were suspended and Mr. Dow was elected on a single ballot cast by the secretary.

Mr. Dow moved that the librarian determine the number of volumes in the library which needed binding and report the estimated cost at the next meeting of the society. Seconded and carried.

Mr. Davis exhibited all of the species of tree crickets occurring in the vicinity of New York and made some remarks concerning the more unusual forms.

Mr. Roberts exhibited all of the Haliplidæ occurring in the United States except two. In remarking on this family of the aquatic Coleoptera he stated that Crotch's attempt to work up the group had perhaps done more harm than good, as he failed to recognize and appreciate good structural characters and did not differentiate the males and females. Mr. Roberts after considerable study had found good distinguishing characters between the males and females in the peculiar character of the fore tarsi of the former sex. He had also found the prosternal process a good specific character as well as the coxal process. Although in several species the markings seem similar, when taken in connection with the structural characters here men-

tioned, differences can easily be detected which are uniform for one species, and the constancy of pattern of maculation is remarkable. He had been able to separate 19 species of *Haliptus* and 10 species of *Cnemidotus*. Nothing concerning the larvæ or of the life history of our species is known.

Mr. Joutel exhibited *Cynthia* and *Promethia* moth hybrids. When the female *Cynthia* is crossed with the *Promethia* male the larva was typically *Cynthia*. In the male *Cynthia* and *Promethia* female cross the larvæ are very different, as the *Cynthia* seem to be the stronger and give the predominating characters to the hybrid.

Mr. Matausch exhibited some excellent color drawings of a number of leaf-hoppers (Membracidae). Upon motion of the secretary the meetings of the society were adjourned until October.

MEETING OF OCTOBER 1, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with ten members and one visitor present.

The librarian, Mr. Schæffer, reported the receipt of the following exchanges during the summer :

Tijdschrift voor Entomologie, Vols. XLIX, No. 4; L, No. 1.

The Decticinae of North America by A. N. Caudell in Proc. U. S. Nat. Mus., Vol. XXXII, pp. 285-410.

Proc. of the Am. Acad. Arts and Sciences, Vol. XLII, Nos. 27 and 28.

Verhandlungen d. K. K. Zool.-bot. Gesell. in Wien, Vol. LVII, Nos. 2, 3, 4, 5, 6, and 7.

Canadian Entomologist, Vol. XXXIX, Nos. 6, 7, 8, and 9.

Deutsche Entomolog. Zeitschr., 1907. Nos. 3 and 4.

Berliner Entomolog. Zeitschr., Vol. 51, No. 4.

Wiener Entomolog. Zeitung, Vol. XXVI, Nos. 4, 5, 6, 7, 8, and 9.

Anales del Museo Nacional de Buenos Aires, 3d ser., Vols. VI and VIII.

A New Butterfly of the Genus *Incisalia* by Cook and Watson.

Mittheilungen d. Schweiz Entomol. Gesell., Vol. XI, No. 6.

The Insect World, Vol. XI, Nos. 5, 6, 7, and 8.

Zeitschr. f. Wissenschaftliche Insekt.-biol., Vol. III, No. 4.

Proc. Davenport Acad. Sciences, Vol. XI, pp. 125-417.

N. J. Agri. Exp. Station Bull., No. 203.

Note on the American Species of Hesperidæ described by Plätz. F. D. Goodman. Rep't of the Entom. Dept. N. J. College Exp. Station for 1906.

Montana Agri. College Exp. Station Bull., Nos. 62 and 64.

Catalogue of the Acarina of the U. S. by N. Banks from Proc. U. S. Nat. Mus., Vol. XXXII.

Descriptions of New Species of Moths by Harrison G. Dyar from Proc. U. S. Nat. Mus., Vol. XXXII.

University of Montana Register, 1906-1907.

Proc. Amer. Phil. Soc., Vol. XLVI, No. 185.

Stettiner Entomolog. Zeitung, Vol. 68, No. 1.

Bull. Soc. Entomolog. Italiana, Vol. XXXVIII, Nos. 1 and 2.

Fungus-growing Ants of North America by Prof. W. M. Wheeler.

Chicago Acad. Sci. Bull., No. 4, Pts. 1 and 2.

Notes on a New Guest Ant by Prof. W. M. Wheeler.

Entomolog. Berichten, II, Nos. 31-36.

Notes on some American Noctuids in the British Museum by Prof. John B. Smith.
Bull. No. 24, Georgia State Board of Entomology.

Ent. Circul. No. 20, No. Carolina Dept. Agriculture.

Proc. Amer. Philos. Soc., Vol. XLVI, No. 186.

The treasurer, Mr. Davis, reported that the society's balance was \$909.86 and the journal's \$197.51.

Mr. Davis exhibited some ants, one of which (*Sysphincta fergandei* Roger) Professor Wheeler mentioned as being a very rare insect, previously taken by only two other collectors, Father J. Schmitt and Mr. T. Pergande. Professor Wheeler had never been able to find a specimen of this species.

Professor Wheeler gave a most interesting account of his summer's trip, briefly sketching his stop in the Azores, Gibraltar, Genoa and in the neighborhood of Lake Geneva. His account of the work of Professor Forel, with whom he visited for six weeks, was most entertaining.

Society adjourned.

MEETING OF OCTOBER 15, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with twelve members present. The proceedings of May 21 and October 1 were read and approved.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Proc. Amer. Acad. Arts and Sciences, Vol. XLII, No. 29.

Canad. Entomologist, Vol. XXXIX, No. 10.

Anales de Museo Nacional de Montevideo, Vol. VI.

Berliner Entomolog. Zeitschr., Vols. LII, No. 1 and XLII, Nos. 1 and 2.

38 pamphlets on Ants presented to the society by Miss Adele M. Fielde through Professor Wheeler.

Mr. Southwick moved that the librarian determine the cost of binding the remaining files of the Journal of the New York Entomological Society and report same at the next meeting of the society.

Mr. Zabriski reported that he was one of a committee appointed by the Brooklyn Entomological Society to prepare a list of insects of Long Island. He requested the coöperation of the members of the New York Society in this work.

Professor Wheeler exhibited the work of an ant (*Azteca muelleri*) in the trunk of the *Cecropia* tree (*Cecropia adenopus*). Professor Wheeler remarked that while in Hamburg during last summer he heard through the Museum there of a man who had brought from Santa Catharina, Brazil, a great number of the trunks of the *Cecropia* tree containing these ant-nests. He was able to secure a number of excellent examples of their workings. Though there was considerable confusion in the synonymy of this particular ant, it was undoubtedly *Azteca muelleri* Emery. A number of *Azteca* species are known and all are neotropical and exclusively arboreal, as they have never been known to nest in the ground. The food of *A. muelleri* is an excretion of the trees produced in peculiar cushion-like growths (*trichilia*) at the bases of the leaf petioles. These ants do not have a sting but are protected by a rancid smelling excretion which acts as a repellant to their foes. These ants make their way into the interior of the

hollow tree trunks by boring holes in preformed pits which occur above each leaf petiole. The large swellings caused by the work of this ant were supposed by von Ihering to be large galls, but Professor Wheeler remarked that it was more likely that the bulging outward of the sap-wood of the trunk was due to stress of weight where the wood becomes thin. Another species of *Azteca* (*A. lanuginosa*) exhibited showed the nest on the outside of the *Cecropia*. Still another made a long pendulous nest. Professor Wheeler also mentioned other peculiarities both in the nests and in the structure of the body of these ants. He also exhibited and spoke of the peculiar "cow-sheds" made by ants over alder aphids (*Schizoneura tessellata*) which he had collected at Lakehurst.

Mr. Davis spoke of experimenting with acetic ether recently as a killing reagent for insects. He placed some "excelsior" in a wide-mouthed bottle and moistened it with this new killing reagent. He found it worked very satisfactorily, not changing the colors of the moths and katydids, which were left sometime in the bottle. It does not evaporate readily and is not as cheap a method as cyanide of potassium. Mr. Bischoff said that he had tried acetic ether as a killing reagent and found it very unsatisfactory, for when the insects were left several hours in the bottle the legs and antennæ became very brittle.

Mr. Davis also exhibited specimens of a beetle (*Coscinoptera dominicana* Fab.) raised from pupæ found in ants'-nests (*Formica schaufussi*) in Newfoundland, N. J.

Professor Wheeler exhibited a series of myrmecophilous beetles and Lycænid larvæ which he had recently received from Staudinger and Bang-Haas of Dresden. He spoke of the glands on the Lycænid larvæ and the peculiar extrusile processes which were covered with plumose hairs, on the dorsal part of the last segment. The function of these organs is still unknown. Of the myrmecophilous beetles he spoke particularly of the members of the genus *Paussus*, none of which occur in North America. He called attention to the fact that these beetles secrete pure iodine, according to Loman. The antennæ are peculiar in shape, the ants using them as handles with which to carry the beetles about. Some curious ant-like spiders from Peru were also shown.

Mr. Engelhardt showed the flattened cases made by the fastening together of oak leaves by the larvæ of the moth *Cecinnus melsheimeri* Harris. In some of these the larvæ were still present.

Society adjourned.

MEETING OF NOVEMBER 19, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with eleven members and several visitors present.

The report of the treasurer, Mr. Davis, was read and accepted. Mr. Schaeffer, the librarian, reported the receipt of the following publications:

Deutsche Entomolog. Zeitschr., 1907, No. 5.

Mitth. aus d. Zool. Mus. in Berlin, Vol. III, No. 3.

Proc. Davenport Acad. Sci., Vol. X, Vol. XII, June and July.

Wiener Entomolog. Zeitung, Vol. XXVI, No. 10.

On Some Earwigs by A. N. Caudell.

Descr. of New N. Amer. Tineid Moths by Lord Walsingham.

No. Carolina Dept. Agric. Ent. Circul., Nos. 18 and 19.

No. Carolina Crop Pest Commission. Circ. No. 10, New Series.

Canadian Ent., Vol. XXXIX, No. 11.

Tijdschr. voor Entomologie, 1907.

As chairman of the committee to arrange for the binding of the unbound numbers of the Journal, Mr. Schaeffer reported that he had obtained an estimate of \$1.50 per volume for a binding similar to that of the volumes already bound. On motion by Mr. Joutel, seconded by Dr. Wheeler, the report was accepted and the committee instructed to have the binding done.

The name of Mr. James H. Stebbins, Jr., was proposed for membership.

Under miscellaneous business Mr. Schaeffer reported that the specimens of Lepidoptera presented to the society by Mrs. Slosson, and to be sold for its benefit, had been mounted and identified by Mr. Doll.

The first paper of the evening was by Mr. Joutel on "Some Curious Results of the Crossing of *Cynthia* and *Promethea* Moths and Some Interesting Variations of *Cynthia*." He said he had obtained a number of hybrid moths as a result of crossing *Cynthia* and *Promethea* and exhibited a series of these. Of the crosses between the male *Cynthia* and female *Promethea* only one moth was obtained, while from the reciprocal cross a large series of moths was secured. The caterpillar of the latter cross was very similar to that of *Cynthia* but that of the other was quite distinct in appearance. The hybrid moths resembled *Cynthia* very much but when carefully compared showed decided differences. They were uniformly smaller than *Cynthia* and there was a narrowing of the transverse lines which tended to approach each other at their middle points. These same variations, however, were occasionally found among true *Cynthia*. Of the two crosses, that obtained by mating male *Promethea* with female *Cynthia* was the stronger, and further experiments were being carried on by crossing these among themselves.

Mr. Schaeffer next spoke on "A Few New and Interesting Cerambycidae." He had recently gone over his collection of Cerambycidae and noted several new and interesting forms, some of which he exhibited and briefly discussed.

Mr. Schaeffer also exhibited a box of insects which he had collected in Arizona illustrating mimicry and protective coloration and spoke concerning them briefly as follows: The grasshopper — *Tomatus ferruginosus* — a species with red hind wings was observed moving rapidly along the road and was difficult to capture, but when resting on the oak leaves where its color protected it, it made little effort to get away. He had found that the walking-stick *Tarabacillus coloradus* dropped to the ground readily and on account of its color was difficult to find. In like manner *Stagmomantis limbata* was also found to be well protected when resting on the grass. In beating, a few specimens of the Cerambycid, *Elytroleptus ignitus*, were noted among hundreds of the Lampyrid, *Lycostomus loripes*, which it very closely resembles. Another species of Cerambycidae, *Necydalis cavipennis*, was mistaken at first for a common species of *Polistes* which it closely resembles both in action and general appearance. A fly, *Dasyllis fernaldi*, closely resembling *Bombus ternarius*, was also noticed, and the moth, *Tiprocris constans*, taken in some numbers, could easily be mistaken for the beetle *Lyctus ferandesi*, which it closely approaches in color, markings and flight. Besides these he had observed many other instances while in Arizona.

Dr. Wheeler spoke of a species *Mantispa* resembling *Polistes*, and Mr. Joutel mentioned *Eudermes picipes* as a Coleopteron resembling an ant. Mr. Davis described

the manner in which the grasshopper, *Spharagemon saxatile*, rests on rocks where it is well protected by its color, and mentioned the many Sesiidæ resembling Hymenoptera and especially the species *Ægeria apiformis*, which is so named on account of its mimetic resemblance. Mr. Davis also exhibited several species of *Conocephalus* showing that both the brown and green forms of the various species could be found.

Dr. Zabriskie spoke "On the Swarming of the Weevil *Sphenophorus*." He said that recently his son, who was employed in the Diehl Co., which is part of the Singer Mfg. Co., situated at Elizabethport, N. J., called his attention to the fact that a weevil was swarming at that place in immense numbers. On securing some of the insects he found that they were *Sphenophorus pertinax*. They came from a northerly direction and in such immense numbers that they became a nuisance. Many of them struck against the walls of the buildings and fell to the ground. Evidently they were aided in their flight by the gentle wind which was blowing at the time. The swarm lasted three days before it began to disappear. A box containing several species of this genus was exhibited by Dr. Zabriskie, who inquired whether any of the members had noted a similar swarming. It was mentioned that the beetles probably came from the marshes directly north of Elizabethport where they breed in the cattails, and Dr. Wheeler stated that he had seen numbers of them washed up on the shores of Lake Michigan. Mr. Leng stated that at one time he had observed a swarm of *Melanactes piceus* on Staten Island. Dr. Zabriskie said that he had noticed a variation in the color of the insects and that upon examination he found the coloring to be due to numerous fine hairs. Dr. Wheeler stated that in *Lixus* the coloration had been found by Leidig to be due to secretions which were replaced when rubbed off.

Dr. Wheeler said that on November 3 while at Garrison-on-Hudson he had found a number of nests of *Polistes metricus* attached to a boat-house and that hanging on some of these were a few females, larvæ in cells, and honey in some of the empty cells. Thus a tendency was indicated by these insects to store food and hibernate. He stated further that Marshal and other European writers had noted this tendency in some species, among others *Polistes gallica*. A *Polistes* in California had been observed storing honey in quantity in its combs and this was also done by many species of South American wasps. A nest in the museum of a species of *Polybia* from Mexico Dr. Wheeler had found interesting in this respect. There was a zone of brood in the center of the combs of the nest, then a circle of empty cells and finally an outer zone of honey-filled cells. Accounts tell of early travelers in South America finding these nests, eating the honey and becoming sick as a result. In temperate regions this instinct is rarely noted and is probably a vestige of a *Polistes* habit well-developed in a former age when the insect lived in warmer regions. Mr. Southwick stated that he had examined many nests of *Polistes* but had never been able to find any honey in them.

In the early part of the year, on Staten Island, Mr. Davis observed on the same day in tin cans a number of *Polistes* nests and had found from one female and three cells to three females and several cells present. In Texas, it was noted, that many *Polistes* hibernate together.

Society adjourned.

MEETING OF DECEMBER 3, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with fifteen members and four visitors present.

The proceedings of October 15 and November 19 were read and approved.

On motion of Mr. Southwick, Mr. J. H. Stebbins, 3 West 29th St., was elected an active member of the society.

Mr. Frank Watson, through Mr. Davis, proposed as an active member Mr. John H. Cook, 12 McPherson Terrace, Albany, New York.

Professor Raymond C. Osburn, of Barnard College, spoke concerning "The Syrphidæ of British Columbia." Among other things he described the striking structural characters of the family which are found in the venation of the wings, shape of head and abdomen and character of the antennæ. He spoke also of the mimetic forms of which there are a large number. The Syrphidæ are world wide in their distribution. About 2,500 species are so far known, but the tangled synonymy leaves the exact number in doubt. Verral lists 800 species from Europe and Aldrich in his list gives 680 species for all of North America. In 1886 Williston gave 300 species for the United States and Canada but many have been added since. It is likely that nearly 1,000 species may be accredited to the whole of North America.

In the summer of 1901 and 1902 Professor Osburn collected in British Columbia mainly about the southwest portion of Vancouver Island and incidently at Glacier, in the Selkirk Mts. In 1904, with the assistance of Mr. Harvey, he published a list of the Syrphidæ obtained by the latter, since which time he has received a considerable amount of new material from Mr. Harvey and others, and Dr. Dyar and Mr. Caudell in 1905 brought back some 41 species as a result of their collecting in British Columbia. Of these six or seven are new species. Of the 50 Syrphidæ more or less sent in by Mr. Harvey since the publication of the first list, six are new. Professor Osburn has examined all of the Syrphidæ in the National Museum and has altogether a list of 130 species from British Columbia. He spoke of the richness of the territory entomologically considered, of the great abundance of flowers upon the pollen of which the majority of the Syrphidæ love to feast, of the delights of collecting all through British Columbia. In regard to the distribution he said that nearly a fourth of the 130 species known from British Columbia are circumpolar. The remainder are about equally divided between those known only from the west and those which are also recorded from eastern North America and spreading clear across Canada and British Columbia. He found quite a number of forms that had spread north from California. He exhibited the new species of Syrphidæ from British Columbia, descriptions of which will soon appear in the Canadian Entomologist. Among the other important species shown were *Syrphus quinquelimbatus* Bigot, *Helophilus porcus* Walker and *Brachypalpus parvus* Willist., none of which has been recorded since they were described. *S. quinquelimbatus* was described in 1884 from southern California, *H. porcus* in 1849 from the Hudson Bay Territory and *B. parvus* in 1886 from Colorado. Forms which have recently acquired considerable economic importance are *Cheilosia alaskensis* Hunter and *Cheilosia hoodiana* Bigot, the larvæ of which have recently been shown by Burke to be the cause of the timber disease of the northwest affecting conifers and especially the western hemlock.

Professor John B. Smith took issue with Professor Osburn on the geographical range of insects from British Columbia, since he had found in the study of the Noctuidæ that there were almost no circumpolar forms and that the Noctuidæ from Vancouver region showed no southern California forms among them, but this faunal

region seemed to be distinctive, mixed with some few eastern forms which had spread westward throughout Canada.

Professor Wheeler remarked that he had found in the study of the ants a sort of intermediate condition and agreed with Mr. Charles Adams that there seemed to be two centers of distribution in British Columbia, an eastern and a western one, and that material gathered from north of Lake Superior showed a mixture of the two conditions.

Mr. Joutel said that *Saperda calcarata* and *tridentata* spread clear across the country in the north, and the western forms were like the eastern.

Mr. Joutel, in speaking of "The Persistence of Acquired Characters in Different Stages of Insects," stated that he had been inbreeding for a number of years a species of Japanese Bombycine moth and no deterioration in size or health was noticeable in recently bred adults or larvæ. Occasionally he had noticed a denuded specimen hatching from an apparently normal cocoon, and in one species he had found five newly hatched denuded adults, but was not successful in mating two denuded forms. He did succeed in mating and securing eggs from one denuded and one undenuded adult moth. The eggs obtained from this mating of the denuded form were different from the normal egg in not having a coating on them, which makes it appear probable that this peculiarity was due to some condition of the adult.

Mr. Matusch exhibited numerous, excellent and well-colored original drawings of exotic Membracidae. Most of the species represented were from South America.

Mr. Davis exhibited sections of a white pine tree, each about a foot in diameter, showing the tunnels and chambers made by the carpenter ant, *Camponotus herculeanus pennsylvanicus* De Geer. The tree had stood over 60 feet high and was one of a grove on Staten Island, but the ants had removed so much of the solid wood that it had snapped off about 6 ft. from the ground during a gale of wind. The nest occupied about 4 in. of the diameter of the tree, and for the first four feet most of the wood had been removed. Above this, for 15 in., there were galleries and chambers, and above this again there was a finger-like tunnel $\frac{1}{2}$ in. in diameter and 8 in. long, that occupied the center of the trunk. Mr. Davis also showed a section of a scarlet oak that had been occupied by the same species of ant, and the nest was divided off in the same way as in the pine, with this difference that the character of the oak wood did not permit of the excavation, in the lower part of the nest, of the many paper-like layers represented in the corresponding portion of the nest in the pine. No matter in what kind of a tree, there seems to be constructed by this ant the same general kind of architecture.

Professor Wheeler exhibited a beetle (*Xenodusa cava*) a number of which Mr. Pricer of Urbana, Illinois, found in the burrows of *Camponotus pennsylvanicus*. This beetle is not common in collections.

Dr. E. P. Felt stated that considerable time had recently been spent by his office on investigations of gall midgets (Cecidomyiidae), but he had found it rather slow work and had been much handicapped owing to the tangled synonymy of the group. To show how much work they had been able to accomplish towards collecting and breeding these forms he gave a table showing side by side with the number of species given by Aldrich in his list, the number they had been able to add. Whereas, of those groups already investigated, a total number of 24 species is given by Aldrich, Dr. Felt has secured something like 217, and of these, too, a large

number of the galls have been studied and determined. Dr. Felt presented some of the difficulties which he had met in solving the problem of nomenclature in this group and asked for suggestions in solving the problem. They had reached a point in their work where to advance meant an answer to the question, what constitutes a description of a species. Mr. Southwick suggested that where the name of a certain insect had originally been given to the gall, and later to the insect itself, the former should be dropped. Professor Smith had little patience with this advice and stated that wherever the work of the insect had first received the name, and it could be determined as such, its name should be attached to the insect. He resented any implication that the descriptions of the older entomological workers were not satisfactory for their needs, and suggested that twenty years hence our descriptions of species would be found insufficient for the new conditions which might arise. Every worker who took up a group encountered the same trouble.

Professor Wheeler said that after all, the work of the insect was the most important consideration, and if the identity of the adult insects could not be determined, numbers might be employed to indicate them, as it made little difference what particular symbols were employed or whether the insect itself or the gall received the name. The important thing was to connect the proper insect with the proper gall.

Society adjourned.

MEETING OF DECEMBER 17, 1907.

Held at the American Museum of Natural History. President C. W. Leng in the chair, with eleven members present and three visitors.

The proceedings of December 3 were read and approved.

The librarian, Mr. Schaeffer, reported the receipt of the following papers :

"Origin of Slavery among Ants," by Professor Wm. M. Wheeler.

"On Certain Modified Hairs Peculiar to the Ants of Arid Regions," by Professor Wm. M. Wheeler.

Mr. J. H. Cook, of Albany, was elected an active member on motion of the secretary.

Mr. Beutenmüller proposed Mr. Andrew J. Mutchler, and Mr. Barber proposed Mr. Raymond C. Osburn as active members of the society. Elected by amending by-laws.

The secretary read a letter from the curator of entomology of the American Museum of Natural History, Mr. W. Beutenmüller, in which he invited the members to examine the entomological cabinets, which would be in charge of Mr. Mutchler on the meeting nights of the society.

Mr. Davis requested that the secretary express the thanks of the society to Mr. Beutenmüller.

The secretary read a letter from the secretary of the New York Academy of Sciences, Dr. E. O. Hovey, requesting the society to coöperate in arranging a course of lectures during the winter. On motion the letter was referred to the executive committee.

The president named the following committee to nominate officers for the coming year : Messrs. Joutel, Harris and Engelhardt.

Mr. Engelhardt discussed some of the work in silk culture, which had been attempted at the Children's Museum in Brooklyn. This work had been suggested by Mr. Joutel who had furnished some of the raw and finished silk to illustrate the

process. Some 3,000 silk worms were reared, and of these 300 were inflated and the rest allowed to pupate. Some of the pupæ were treated and the silk taken from the cocoons, a reel being made for the purpose. Photographs of the machinery and process were used to illustrate the exhibit in the museum. Mr. Engelhardt exhibited some silk gut which he had obtained from *Cecropia* and explained the process by which it was prepared, but his experience had shown this gut to be rotten. Nevertheless, it might be possible to perfect the process and thus obtain valuable gut. He spoke of the process as carried on chiefly in Spain and Italy with the true silk worm.

Mr. Engelhardt also exhibited some abnormal specimens of insects: a *Cecropia* with an extra fore wing and a katydid with two tarsi on the same leg. He spoke of the frequency of malformation in vertebrates, particularly among fish, and accounted for this through some accident or unusual condition to which the egg had been subjected. In this connection Mr. Davis exhibited an ox-beetle from Brazil which had three tarsi on one of the fore legs.

Mr. Joutel exhibited an *Elaphidion* with two antennæ springing from one basal joint, also a *Cremastochilus* which had the two front tibiæ on the left side unlike. To illustrate this subject further Mr. Osburn exhibited drawings of the head of *Syrphus arcuatus* which had only one compound eye and three antennæ. The extra antenna occupied the place where the normal eye should appear. The whole head was deformed. This malformation was probably due to injury during its early development. He spoke of a similar condition in the Crustacea determined by Herbst and also by Morgan. When a compound eye of these Arthropods is removed at the proper stage it will be replaced by an antenna.

Professor Wheeler spoke of a Dipteron (*Dilophus tibialis*) which he collected in Wyoming, and which had a beetle-like antenna growing out of one of its fore coxæ.

Mr. Joutel spoke of the importance of an attempt to cross and rear some of these monstrosities to determine whether the malformation would be inherited by the offspring; also of the frequency of abnormalities in trout caused by a disturbance of the eggs.

Mr. Schaeffer made some remarks on the factors which should determine faunal regions. He stated that his experience had shown that it was a mistake to place too much dependence upon insects of a particular region as factors in determining a faunal region, although certain groups, which were more fixed in their habits, might be taken as indicative. For instance, a number of collectors have maintained that Brownsville has a semi-tropical fauna. As a result of his investigations in that region, Mr. Schaeffer had found that in the Cerambycidae taken there only 35 per cent. were semi-tropical; of the Lepidoptera only 20 per cent. were semi-tropical; the remainder belonging to the southern faunal regions of the United States. Investigation had shown that the flora of a particular region was the best determining factor.

Society adjourned.

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- CASEY, THOS. L. Studies in Ptinidæ, Cioidæ, and Sphindidæ of America. 32 pp. 75c.
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- Review of the American Corylophidæ, Cryptophagidæ, Tritomidæ and Dermestidæ, with other studies. (Cuts) 121 pp. \$2.00.
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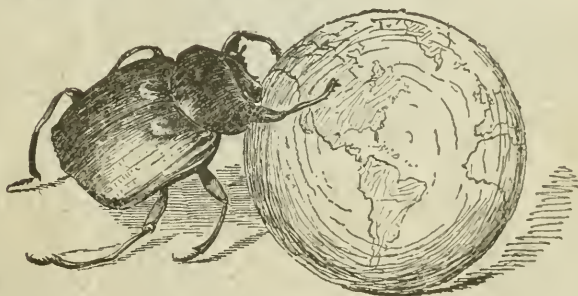
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No. 3.

ON NEW AND KNOWN COLEOPTERA OF THE FAMILIES COCCINELLIDÆ AND CLERIDÆ.

BY CHARLES SCHAEFFER,

BROOKLYN, N. Y.

FAMILY COCCINELLIDÆ.

***Psyllobora plagiata*, new species.**

Size of *20-maculata*, punctuation slightly finer; thoracic spots similar but not as heavy as in the average *20-maculata*. Elytra with two spots on each side of base, two median subsutural spots and below these a large, broad, more or less angulate, oblique black patch and three spots of variable size near side margin, the first slightly antemedian, the second below this but further removed from the margin than the first and third, the latter situated at about apical fifth and on each side of suture a sub-apical spot. Under side of body as in *20-maculata*.

Huachuca Mts., Arizona.

Some of the spots near suture or side margin may be absent or very faint, but the large postmedian patch is always present.

***Brachyacantha arizonica*, new species.**

Slightly smaller and more rounded than *ursina*, similarly marked, but without median spot on lateral margin and with basal spots always confluent. Head pale in the male; pale at middle, black at apical margin and infusate at sides in the female. Thorax black, apical margin and a large triangular spot at sides pale in the male, in the female the apical margin very narrowly and a narrow subtriangular spot at apex, which extends slightly below middle, pale. Elytra black, two basal spots on each side, large and always broadly confluent, a large rounded, discal spot near suture and large apical spot nearer the margin than suture yellowish or reddish. Punctuation of thorax and elytra as in *ursina*. Under side of body black; legs pale in the male; femora piceous, tibiae and tarsi pale in the female. Anterior tibiae with the usual tooth near base, and in addition a smaller, but more obtuse one near apex.

Abdomen in the male as in *ursina*, but the fifth and sixth segments more depressed at middle. Length 3.5 mm.; width 2.75 mm.

Huachuca Mts., Arizona.

This species varies a good deal in the extent of the elytral spots. All the spots may unite more or less and gradually extend over the entire surface, leaving only the suture and apex broadly, the side margin narrowly and a spot on the humeral callus black. This species differs principally from *ursina* and *testudo* by the very large and always broadly confluent basal spots, the absence of the median marginal spot on each elytron, the bidentate anterior tibiae, and in addition from *ursina* by the shorter and more rounded form.

Brachyacantha bistrripustulata var. **decora** Casey, Journ. N. Y. Ent. Soc., Vol. VII, p. 119.

Very abundant near Brownsville, Texas, and with it occurred, though very rarely, the typical *bistrripustulata*.

Hyperaspis weisei, new species.

Form and size of *proba*. Head black, distinctly punctate. Thorax black, side margin broadly pale; surface more finely punctate than the elytra. Elytra black, a marginal vitta extending to about basal half, becoming broader and much dilated inside at its apical end, a discal and two apical spots yellow; punctuation slightly coarser than that of thorax. Body beneath black; abdominal segments coarsely punctate, the last five reddish. Legs pale. Length

Brownsville, Texas. Collected by the late Ottomar Dietz.

Following Gorham in the "Biologia" I reported* this as *kunzei*, which is, according to Weise, a different insect. The inner apical spot is nearer the suture than the apex and rounded, the outer is close to the margin, elongate and shows in one specimen a tendency to become united with the inner spot.

Hyperaspis lengi Schaef., Bull. Brooklyn Inst. Mus., Vol. I, p. 146.

I have one specimen of this species from the Huachuca Mts., Arizona, with the discal and apical spots not connected, resembling closely *rotunda* Casey. The latter species is, however, always more globose, has the front angles of thorax rather produced, in *lengi* not at all produced, and the clypeus feebly truncate-emarginate, in *lengi* distinctly arcuate-emarginate.

Hyperaspis pratensis Lec.

This species, which was described from Kansas, seems to be rare in collections. I have a specimen from Hopatcong, N. J., collected by

* Bull. Brooklyn Inst. Mus., Vol. I, p. 145.

the late Ottomar Dietz. It resembles *Brachyacantha bistripustulata* in size and markings but is of slightly more elongate form.

FAMILY CLERIDÆ.

List of Species from Brownsville, Tex.

<i>Macrotelus terminatus</i> Say.	<i>Clerus lunatus</i> Spin.
<i>Macrotelus terminatus</i> var. <i>pallipes</i> n. var.	<i>Hydnocera tricolor</i> Schaef.
<i>Tillus elegans</i> Er.	<i>Hydnocera pubescens</i> Lec.
<i>Cymatodera turbata</i> Horn.	<i>Hydnocera omogera</i> Horn.
<i>Cymatodera oblique-fasciata</i> Schaef.	<i>Hydnocera discoidea</i> Lec.
<i>Cymatodera brunnea</i> Melsh.	<i>Hydnocera knausi</i> Wickh.
<i>Cymatodera sirpata</i> Horn.	<i>Hydnocera schusteri</i> Lec.
<i>Cymatodera balteata</i> Lec.	<i>Chariessa vestita</i> Spin.
<i>Cleronomus (Colyphus) furcatus</i> Schaef.	<i>Cregya mixta</i> Lec.
<i>Clerus quadrisignatus</i> Say.	<i>Pelonium maculicollis</i> Schaef.
<i>Clerus abruptus</i> Lec.	<i>Enoplium granulatifenne</i> Schaef.
<i>Clerus crabronarius</i> Spin.	<i>Enoplium nigrescens</i> Schaef.
	<i>Orthopleura texana</i> Bland.
	<i>Necrobia rufipes</i> Fab.
	<i>Necrobia violacea</i> Linn.

List of Species from the Huachuca Mts., Arizona.

<i>Cymatodera antennata</i> n. sp.	<i>Clerus quercus</i> Schaef.
<i>Cymatodera puncticollis</i> (Bland) Horn.	<i>Clerus abruptus</i> Lec.
<i>Cymatodera latifascia</i> Schaef.	<i>Clerus nigriventris</i> Lec.
<i>Cymatodera oblita</i> Horn.	<i>Clerus pinus</i> Schaef.
<i>Cymatodera flavosignata</i> n. sp.	<i>Clerus mastus</i> Klug.
<i>Cymatodera bicolor</i> Skin.	<i>Hydnocera niveifascia</i> Schaef.
<i>Cymatodera californica</i> Horn.	<i>Hydnocera unifasciata</i> Say.
<i>Cymatodera undulata</i> var. <i>arizonica</i> n. var.	<i>Hydnocera arizonica</i> n. sp.
<i>Cymatodera lœvicollis</i> n. sp.	<i>Hydnocera cribripennis</i> Fall.
<i>Cymatodera</i> sp.	<i>Hydnocera simulans</i> n. sp.
<i>Trichodes illustris</i> Horn.	<i>Hydnocera nigrina</i> n. sp.
<i>Clerus spinolæ</i> .	<i>Phyllobenus dislocatus</i> Say.
<i>Clerus bioculatus</i> Skin.	<i>Enoplium humerale</i> Horn.
<i>Clerus ocreatus</i> Horn.	<i>Lebasiella discoidea</i> Lec.
	<i>Lebasiella mesosternalis</i> n. sp.
	<i>Necrobia rufipes</i> .

*Descriptions of New Species and Notes.***Macrotelus terminatus** var. **pallipes**, new variety.

Form and size of *terminatus* from which it differs by the almost entirely black prothorax, brown elytra and pale tibiæ.

Brownsville, Texas.

The moderately large series which I have taken or raised from branches of *Acacia farnesiana* and *Acacia flexicaulis* differs constantly in the above-mentioned characters from *terminatus*; of the latter I obtained only one specimen. The metasternum is also more or less reddish in this variety.

Cymatodera antennata, new species.

Color dark brown; antennæ, palpi, legs and under side paler. Head moderately coarsely and densely punctate; pubescence sparse. Eyes prominent. Antennæ reaching to about middle of elytra; joints two and three small, together as long as joint four; joints four to eleven equal, subserrate. Prothorax twice as long as wide at apex; rather strongly constricted at basal third, less strongly at apical third; surface rather sparsely pubescent and densely punctate, the punctures, especially at sides, more or less confluent. Elytra twice as wide as the thorax at base; parallel to about apical fourth; apices rounded; pubescence short and rather inconspicuous; the row of punctures becoming gradually finer posteriorly and entirely obliterated at apex; intervals as wide or slightly narrower than the punctures, sparsely, finely, irregularly punctate. Under side of body scarcely pubescent, meso- and metasternum densely and moderately coarsely punctate; abdomen very finely and densely punctate. Legs sparsely pubescent. Length 7-9 mm.

Male. — Fifth ventral segment truncate at apex. Sixth short, broadly but feebly emarginate at apex. Last dorsal segment truncate at apex, as wide as the last ventral.

Female. — Sixth ventral short and broadly rounded.

Huachuca Mts., Arizona.

The short second and third antennal joints bring this species near *longicornis* from which it is distinguished by the uniform color, the form of the last ventral segments of the male, and the subserrate antennæ. It resembles *cylindricollis* Chev. closely, but has the eyes larger, more narrowly separated and the antennal joints four to ten wider.

Cymatodera pallida, new species.

Yellowish-testaceous, head and thorax slightly darker. Head shining, rather sparsely and finely punctate and feebly pubescent; eyes prominent, rather widely separated; antennal joints two, three and four nearly equal in length, narrower than five and following joints and each shorter than joint five. Thorax feebly constricted subapically, laterally strongly compressed below middle, thence slightly divergent to base; surface rather sparsely punctate and not densely pubescent. Elytra parallel, apices rounded; rows of punctures coarse, towards apex finer; intervals as wide or near

base slightly wider than the punctures ; pubescence short, not very abundant. Metasternum sparsely punctate ; abdomen more densely and finely and scarcely at all pubescent. Length 5-6 mm.

Male. — Fifth ventral segment broadly but feebly emarginate ; sixth narrower ; short and feebly emarginate at apex ; last dorsal as wide as the last ventral but slightly longer and truncate at apex.

Female. — Last ventral and dorsal segments rounded at apex.

Huachuca Mts., Arizona.

This species is allied to *puncticollis* (Bland) Horn, and *delicatula* Fall, but is more elongate, has the eyes more widely separated and differs also in the form of the last dorsal segment of the male.

***Cymatodera latefascia* Schaeff.**, Jour. N. Y. Ent. Soc., Vol. XII, p. 216.

This species, of which I now have seen more material, seems to be very close to *cylindricollis* and may prove to be the same ; it differs very slightly from a female Mexican specimen sent me as somewhat doubtfully that species by Mr. Schenkling.

***Cymatodera flavosignata*, new species.**

Elongate, dark brown ; elytra with an irregularly angulate, narrow median fascia yellow, below this and also near base and around humeri a few more or less distinct pale streaks. Head coarsely and densely punctate. Eyes moderate. Antennæ reaching slightly below humeri ; joints elongate, the second shorter than third, the outer slightly subtriangular. Prothorax elongate, feebly constricted at apical third, more distinctly so at basal third ; disk moderately, coarsely and more or less confluent punctate ; pubescence moderately dense and longer than on elytra. Elytra about one and one half times as wide as thorax at base ; feebly widening posteriorly ; apices arcuate truncate, sutural angles rounded ; rows of punctures moderately coarse, more or less obliterated from the middle to apex on the disk but continued nearly to apex at sides ; intervals rather sparsely punctate in basal half, much more densely from middle to apex, surface rather sparsely pubescent. Under side sparsely pubescent ; mesosternum coarsely punctate ; metasternum and abdomen finely and sparsely punctate. Legs more densely pubescent than abdomen. Length 12 mm.

Male. — Fifth ventral segment broadly arcuate-emarginate ; sixth parallel, broadly arcuate-emarginate, not carinate on the disk, but the apical and side margins slightly thickened. Last dorsal narrower than last ventral, elongate, narrowing to apex, and deeply, subtriangularly notched at middle, the angles rounded ; the surface above the incisure broadly and rather deeply impressed.

Female. — Fifth ventral very feebly arcuate-emarginate ; sixth elongate and rather strongly narrowing to apex, which is broadly but rather feebly emarginate. Last dorsal more deeply emarginate with the angles more or less acute.

Huachuca Mts., Arizona, July and August.

The narrow, strongly undulate yellow median fascia and the form of the last ventral and dorsal segments of both sexes make this an easily recognizable species. It should be placed near *morosa* Lec.

***Cymatodera lævicollis*, new species.**

Form, color and markings nearly as in *sirpata* but thorax reddish brown, shining and the entire apex of elytra black. Head shining, moderately densely punctate; front with two impressions, between these the surface is convex; eyes rather small and feebly prominent; antennæ scarcely reaching beyond base of prothorax, second joint slightly shorter than any of the following joints, the joints nearly equal in length, but the outer slightly stouter. Thorax feebly impressed in about apical fourth, below the impression moderately broadly dilated; strongly compressed laterally in about apical third, the sides then divergent to base; disk almost impunctate, the punctures evident at sides and apex; surface very sparsely pubescent with shorter and longer hairs. Elytra distinctly wider than the head, gradually but feebly divergent towards apex; apices conjointly rounded; the rows of punctures gradually disappearing towards apex, the punctures moderately coarse; pubescence fine and rather inconspicuous. Abdomen somewhat densely punctate and scarcely pubescent; last ventral as wide as the last dorsal, sides oblique, apex feebly rounded. Length 9.5 mm.

Huachuca Mts., Arizona, one female.

This species is best placed near *sirpata* from which it differs in having the thorax very smooth, the eyes slightly smaller and more widely separated, the antennal joints, though similar, slightly shorter and narrower, the impressed front and the apex of elytra largely black. The thorax is not unicolorous but slightly infuscate at sides.

***Cymatodera undulata* var. *arizonica*, new variety.**

Form, size and sculpture of *undulata* from which it differs in having the elytra brown with a lateral, pale median spot. Length 10 mm.

Huachuca Mts., Arizona.

I have given this form a name on account of its close resemblance in form and coloration to *belfragei* and allies. The form is perhaps a little more slender, the pubescence of thorax less dense and the punctuation of head and thorax not as coarse and dense as in the majority of specimens of *undulata*, but this is variable also in the latter. The terminal abdominal and ventral segments as in *undulata*. An entirely brown unicolorous specimen is described by Spinola as *brunnea*.

***Cymatodera cephalica*, new species.**

Apterous, form of *angustata* Spin., dark brown, elytra with a more or less distinct pale, median fascia. Head not densely punctate; surface more or less wrinkled and rather sparsely pubescent. Prothorax elongate; constriction at apical and basal third rather feeble; antescutellar impression distinct; punctuation and pubescence rather sparse and fine. Elytra scarcely wider at base than the thorax; sides slightly

diverging to apex ; apices rounded ; the row of punctures moderately coarse at base finer at sides and apex, on the disk obliterated from about middle to apex ; intervals finely not densely punctate ; surface rather sparsely pubescent. Metasternum rather sparsely punctate, abdomen more densely. Length 10.5–11.75 mm.

Male. — Fifth ventral segment broadly emarginate ; sixth broadly emarginate, the angles not prolonged. Last dorsal notched at middle.

Female. — Fifth ventral less deeply emarginate than in the male ; sixth ventral and last dorsal segments oval and subtruncate at tip.

El Taste and Santa Rosa, Lower California, collected by Mr. Gustav Beyer, to whom I am indebted for the pair.

The abdominal characters of the male are very similar to *ovipennis* Lec. but the sixth ventral is not nearly as deeply emarginate and the impressed line above the notch of the last dorsal present in *ovipennis* is absent in *cephalica*.

Both *angustata* and *cephalica* differ from *vandykei* and *ovipennis* in the apparently larger head, the less prominent eyes and the less deeply constricted apical and basal third of thorax ; the latter is in *cephalica* more shining, the punctuation very sparse and fine, while the punctuation in all our other apterous species is very dense and rather coarse.

Trichodes illustris Horn, Proc. Cal. Acad., Vol. IV, p. 382.

Nearly all the specimens of this species taken in the Huachuca Mts., Arizona, have black legs and vary greatly in coloration. Some of the varieties approach very closely *peninsularis*.

Clerus corallinus Fall, Trans. Am. Ent. Soc., Vol. XXXIII, p. 240.

This is a variety of *abruptus*. Mr. Leng has in his collection a fine series from Texas with the necessary intermediate forms. *Clerus abruptus* is a variable species in regard to coloration, markings and punctuation and it seems to me that *flavosignatus*, *recurvatus* and *latus* are merely variations of *abruptus*, though Mr. Schenkling listed them as distinct species in "Genera Insectorum."

Hydnocera unifasciata Say, Journ. Acad. Phil., Vol. V., p. 175.

One of my Arizona specimens is a little more robust than the average *unifasciata* and if seen alone without other specimens may be considered a different species, especially as the white fascia is absent and the dense laterally directed hairs covering the fascia are easily abraded in not well preserved specimens. This, however, is found also occasionally in eastern specimens.

Hydnocera fuchsi, new species.

Form of *subænea*, black, thorax subæneous, elytra blue, with a transverse median fascia of whitish hairs, apex of front and middle tibiæ, tarsi and antennæ pale. Head very densely and subconfluently punctured; eyes prominent. Thorax slightly wider than long, sides broadly dilated a little below the apex, towards base nearly parallel, basal transverse line strongly impressed, subapical impressed line fine but rather strongly impressed; surface rather densely but not very coarsely punctate, moderately densely pubescent, with recumbent, short, pale hairs intermixed with some longer darker hair; disk at basal half with an almost smooth narrow space. Elytra covering the abdomen, scarcely wider than the head, sides nearly parallel, apices separately rounded and rather strongly serrate; surface coarsely and moderately densely punctate in nearly the whole basal half; apical part below the fascia more densely and cribrately punctured; pubescence rather inconspicuous, fine and short, the hairs denser and longer in a narrow transverse space about middle. Under side rather sparsely pubescent, except the metasternal side pieces, which are more densely clothed with longer white hairs. Length 5.5 mm.

Nogales, Arizona, collected by F. W. Nuppenmacher and given me by Mr. Chas. Fuchs.

Judging from the description, this species seems to be very near the lately described *wickhami* Wolcott, which has the elytra much wider than the head, shorter than the abdomen, and the apices not serrate.

Hydnocera arizonica, new species.

Very similar in sculpture, color and markings to *pallipennis*, from which it differs in the longer, parallel elytra, always covering the abdomen, the obliquely rounded sides at apex and the non-serrate apices of elytra. Length 4.5 mm.

Huachuca Mts., Arizona.

In the two type specimens, male and female, the median band is rather narrow, with irregular outline, and the legs are pale. These are, however, variable; the legs are in some specimens infusate and the median dark band is broader and extends at sides nearly to the humeri. The dark markings on elytra are distinctly greenish.

This species and *niveifascia* occurred commonly on oak in July and August.

Hydnocera cribripennis Fall, Canad. Ent., Vol. XXXVIII, p. 116.

I refer a few specimens from the Huachuca Mts., Arizona, to this species which was described from Fedor, Texas. They differ slightly from the description but not sufficiently to give them a name. The subbasal fascia in these specimens is reduced to a transverse spot which is in one male narrowly connected with the yellow spot seen on the

inflexed portion of the base on each side of the scutellum. The markings, as shown by *omogera*, *discoidea*, etc., differ so greatly that very little stress can be laid on these differences.

***Hydnocera simulans*, new species.**

Form of *scabra* black; head and thorax slightly æneous; elytra bluish black, with a subtriangular basal and a transverse submedian spot yellow; legs yellow, except posterior and intermediate femora and tarsi, which are more or less infusate. Head, including the eyes, nearly as wide as the elytra at base, but narrower than the thorax; densely pubescent, obscuring the surface sculpture. Thorax deeply constricted at apex; sides below the constriction strongly dilated and then nearly parallel to base; sculpture obscured by the dense pale pubescence. Elytra normally covering the abdomen; scarcely narrowing towards apex; apices separately rounded, but the outer margin obliquely rounded and not serrate; punctuation very coarse and close, apical portion below the submedian spot cribrately punctate; pubescence much sparser than on head and thorax, slightly denser and directed outwardly on the submedian, pale spot. Body below sparsely pubescent. Length 4 mm.

Huachuca Mts., Arizona.

I have placed with this species two smaller specimens which have no basal spot, but only the postmedian pale spot, otherwise they do not offer any differences. These seem to be the same as the one mentioned by Gorham in the "Biologia" on page 345 under 14 (c) but not described.

This species is closely allied to *cribripennis* Fall, which has slightly shorter elytra, apices broadly and more evenly rounded and serrate and the submedian spot a little nearer to apex. It seems also to be allied to *rudis* Gorh., which is said to have the sides of thorax not much dilated and head and thorax clothed with black, upright pile, besides the ashy, depressed hairs.

***Hydnocera nunnenmacheri*, new species.**

Blue-black; head and thorax slightly greenish; antennæ and tarsi only paler; elytra with a median fascia of dense, pale hairs. Head densely punctate, pubescence moderate, recumbent, pale, with some longer darker hairs intermixed. Thorax narrower than the head; apical constriction strong; sides strongly dilated; basal impressed line strong; surface densely punctate at sides, very slightly sparser on disk; pubescence moderate, pale, recumbent, intermixed with longer dark hairs. Elytra about as wide as the head, rather short; sides parallel; apices separately rounded and feebly serrate; surface somewhat coarsely but not densely punctate; intervals between the punctures rugose, feebly at base, but more strongly below the median fascia of pale hairs; surface sparsely pubescent with pale, short hairs, intermixed with longer darker hairs, the pale hairs more numerous and denser in a transverse space at middle, forming a fascia. Body beneath sparsely pubescent; abdomen slightly longer than the elytra. Length 4 mm.

Nogales, Arizona, one male kindly given me by Mr. F. W. Nuppenmacher.

This little species is of the form of *scabra*, but with shorter elytra, different punctuation and the fascia of pale hairs at middle. It also resembles somewhat the specimens without basal fascia mentioned above under the description of *simulans*, but these have also longer elytra and a little different elytral sculpture.

***Hydnocera parviceps*, new species.**

Elongate, black; intermediate tibiae and tarsi, anterior femora obliquely in apical half, tibiae, tarsi and antennae, except last joint, pale. Head little wider than the thorax in its widest part; behind the eyes obliquely narrowing; between the eyes shallowly impressed; front rather closely punctate, more sparsely on the occiput; pubescence moderate; eyes moderately prominent; antennal joints short and stout. Thorax as long as wide; near apex more strongly constricted than near base; sides rather broadly rounded, but scarcely dilated, parallel in basal third; surface very finely and densely punctate, intermixed with some more sparsely placed, larger punctures which are absent from a narrow median space; pubescence pale, sparser than on the head and with longer, pale hairs intermixed. Elytra elongate, narrow, about as wide as the head including the eyes, feebly narrowing to apex; the latter dehiscent, separately rounded and not serrate; surface feebly convex at base, flattened and feebly depressed a little before apex, the part behind the depression convex; punctuation moderately coarse and rather close and almost uniform; pubescence pale and sparse. Abdomen about one third longer than the elytra, sparsely punctate and sparsely pubescent with moderately long, pale hairs. Length 5 mm.

Senator, Arizona.

One female given me some years ago by Mr. Charles Palm. This species has a form different from any *Hydnocera* known to me; compared with *longicollis* it is a little more robust, has slightly wider elytra and thorax, and smaller head.

***Hydnocera nigrina*, new species.**

Form of *tabida*, but thorax wider and distinctly dilated at sides; black, front tibiae and tarsi, intermediate tarsi, antennae and palpi pale. Head shining, finely and not densely punctate; front impressed; pubescence sparse. Thorax narrower than the head; sides very distinctly dilated below the subapical impression and parallel below the dilated part; surface finely rugose and not densely pubescent. Elytra at base scarcely wider than the thorax in its widest part; humeri oblique; sides gradually, but not strongly narrowing to apex; the latter dehiscent, separately rounded and not serrate; before the apex depressed, below the depression convex; punctuation rather coarse and close. Under side and legs rather feebly pubescent. Abdomen about one fourth longer than the elytra. Length 4 mm.

Huachuca Mts., Arizona.

By its form this species has to be placed with *tabida* and *longicollis*, from which the distinctly dilated sides of thorax and the dark legs

will separate it. The Central-American *subulata* resembles *nigrina* somewhat but differs in the more attenuated elytra, wider humeri and the elytral apices truncate with the sutural angle mucronate.

***Lebasiella mesosternalis*, new species.**

Form of *marginella* and *pallipes*; black; head, thorax, antennæ, except club, and median part of mesosternum red; elytra dark blue. Head and thorax moderately coarsely and densely punctate, clothed with erect dark hairs. Elytra coarsely and closely punctate; pubescence dark, short and erect as on thorax. Abdomen moderately coarsely and less closely punctate than the elytra. Length 4 mm.

Huachuca Mts., Arizona.

The blue, coarsely punctate elytra separates this species from *marginella* and *pallipes*; the shorter robust form and the narrower intermediate antennal joints which are similar to *marginella* and *pallipes* from the rest of our species.

STUDIES ON MYRMECOPHILES. II. HETÆRIUS.

BY WILLIAM MORTON WHEELER,

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The myrmecophilous beetles of the Histerid genus *Hetærius*, which are widely distributed over the north temperate zone, have attracted the attention of a number of entomologists. Lewis (1884) has described a couple of species (*H. gratus* and *optatus*) from the nests of Japanese ants. The common European *H. ferrugineus* has been briefly studied by Ernest André (1874), Escherich (1897), Forel (1874), Gradl (1879), von Hagens (1865, 1879), Janet (1897), Janson (1857), Lucas (1861), Marseul (1853-62), and Wasmann (1886, 1894, 1898), and several North African species have been described by Lewis (1888a, 1888b) and Thery (1897). Some attention has been paid to our North American *Hetærii* by Brues (1903), Cockereil (1890), Fall (1907), Liebeck (1891), Schwarz (1889), and Wickham (1892).

Most of these authors, however, merely record the occurrence of the beetles with certain ants (in several instances inaccurately identified) but tell us nothing about their habits. Indeed, apart from their occurrence with certain hosts, the habits of all the species, except the

European *H. ferrugineus*, are unknown. We may, therefore, regard this form as the ethological type of the genus. In his "Verzeichniss" (1894), Wasmann has taken great pains to record the names of the host ants with which *ferrugineus* has been found, both by himself and earlier authors. The regular host is unquestionably *Formica fusca*, either alone or when living as an auxiliary, or slave with *F. sanguinea* or *Polyergus rufescens*. Less frequently the beetle occurs in the nests of other European species of *Formica*, several species of *Lasius*, *Tapi-noma erraticum*, *Myrmica scabrinodis* and *Leptothorax acervorum*.

Wasmann (1886) gives the following account of the behavior of *ferrugineus* in nests containing *fusca*: "I believe that the ants are quite indifferent to the beetle, as Forel, too, has remarked ("Fourmis de la Suisse," p. 426). According to my observations *Polyergus* pays no attention to it, and *fusca* little or none. The beetle, nevertheless, is continually foisting itself on the ants. It scampers about among them, climbing now on this individual, and over its back, now on that, and anon allowing itself to be carried along passively on some ant's back. It seeks out by preference the densest swarm of ants and climbs from one to another. *Polyergus* seems to be unaware of its existence. This ant neither starts nor moves her feelers or legs but behaves as if the *Heterius* were not walking over her. Once only I saw a *Polyergus* throw the beetle off, but the latter had run over her clypeus just as she was about to clean her face with the strigil of her fore leg. When a *Polyergus* encounters the beetle she takes no notice of it, and this is usually also the case with *fusca*. Twice, however, I saw a *fusca* touch the beetle's head and thorax with her mouth, but I was unable to determine the nature of the contact as it lasted only a few seconds. It was certainly not accidental. During this encounter the beetle applied its legs to its body and remained motionless, but hurried away as soon as the ant withdrew her mouth. I repeatedly saw a *fusca* take notice of one of the beetles. She approached it slowly, palpated it from a distance with her antennæ and then remained standing for some time without touching it. Apparently she was in doubt about the object and afraid to feel of it again. When a beetle crept about on a *fusca* the latter sometimes (but rarely), moved impatiently, but did nothing more. The beetle feeds on dead and wounded ants. I saw it repeatedly perched on the abdomen of such ants, boring with its head and fore feet into a wound and remaining in this position for some time." Wasmann (1908) made similar observations on a speci-

men of *H. ferrugineus* placed in a mixed colony of *F. exsecta* and *fusca*. In this case, however, the ants licked the beetle more frequently and effusively.

These and other observations have led Wasmann to regard *H. ferrugineus* when nesting with *F. fusca* as a synœkete, or indifferently tolerated guest. Janet (1897), too, who observed the beetle in artificial nests of the same ant, came to a similar conclusion. He found the beetle mating during July and during June making attempts to escape from the nest.

The following observations, however, prove that in nests of *Lasius alienus* the relations between the beetle and the ants are much closer and more in the nature of symphily. Escherich (1897), who studied these insects in Asia Minor, says: "I kept six of these beetles and a few *Claviger* for eight weeks in an artificial nest and would summarize my observations as follows: The *Heterii* are true guests or closely allied to the true guests, as Wasmann has already stated. The ants often lick the beetles, their pygidium, wing covers, etc., as I have repeatedly and clearly discerned under a lens. As a second fact in support of this opinion, I may state that *Heterius* is not infrequently carried about by the ants, an occurrence which has been observed in many true guests (*Claviger*, *Paussus*, etc.). This transportation, which is perhaps best interpreted as a kind of 'play' or 'practice,' indicates that the ants, when attacked, or when moving to a new nest, carry their guests with them, just as they carry their larvæ and pupæ on such occasions. . . . Before leaving *Heterius*, let me relate a little episode from the life of this Histerid. On uncovering the nest I saw an ant attempting to seize one of the beetles. Time and again she made the attempt, but her mandibles kept slipping from the beetle's polished, chitinous integument. Finally she succeeded in seizing the stranger by the leg and was thus enabled to carry it a short distance, till it suddenly slipped out of her jaws. Thereupon she made no further attempts to seize it with her mandibles, but rolled it along a considerable distance with her fore feet, as if it were a barrel, while it kept its legs closely applied to its body."

Although the typical hosts of *H. ferrugineus* are Camponotine ants of the genus *Formica*, some of the North African species have been found in the nests of Myrmicinae. *H. plicicollis* Fairmaire lives with *Aphano-gaster striola*, according to Bedel (Wasmann, 1894), and *H. chobauti* Thery with *Monomorium salomonis* (Thery, 1897). Other species,

according to Lewis (1889), live with *Aphænogaster testaceopilosa*, and, according to Lucas (1855), *H. cavisternus* is found in the nests of *Messor barbarus*.

Our American species are nearly always found in the nests of *Formica* species, as shown by the following records:

1. *H. blanchardi* Lec. — Recorded from a nest of *Aphænogaster fulva* by Schwarz (1890).

2. *H. morsus* Lec. — Taken in a nest of *F. fusca* var. (probably *argentata*) at West Cliff, Colorado, by Cockerell (1890).

3. *H. horni* Wickham. — Taken during May by Wickham (1892) in the nest of *F. schaufussi* at Cheyenne, Wyoming.

4. *H. minimus* Fall. — Taken during March at Boulder, Colorado, by Cockerell in a nest of *Lasius niger* var. *americanus*.

5. *H. tristriatus* Horn. — Schwarz (Wasmann, 1894) mentions this species as occurring in nests of *F. fusca* var. *subænescens* in Colorado, and of *F. obscuripes* in the District of Columbia. The latter locality is probably a *lapsus calami* for British Columbia, since *F. obscuripes* does not occur in the Atlantic States and *H. tristriatus* is likewise a western insect. Schwarz (1890) also cites this beetle as occurring with *F. schaufussi* at Helena, Montana. Brues (1903) has figured a specimen taken by Professor H. Heath in a nest of *F. subpolita* at Pacific Grove, California.

6. *H. brunneipennis* Rand. — This beetle appears to be confined to the Eastern States and has been taken only in the nests of our common species of *Formica*. It is cited by Schwarz from nests of *F. fusca* (evidently var. *subsericea*) and I have taken it both with this ant in New York State and with *F. neocinerea* in Illinois (1902). Blanchard and Liebeck (1891) have encountered it in the larger mounds of *F. exsectoides*.

H. brunneipennis is the only one of our American species whose habits have been briefly noticed, and the only account of these which I have seen, is the following note published by Liebeck some years ago: "A recent addition to the collection at the Academy of Natural Sciences of Philadelphia is a hill of the mound-building ant, *Formica exsectoides*, from the vicinity of Altoona, Pa., containing a living colony of ants, measuring about three feet in diameter at the base and about two feet high. It is remarkable, considering the size, that over two hundred examples of *Heterius brunneipennis* have been captured upon the exterior of the hill, seemingly creating a doubt as to whether

it is really a colony of ants, or one of *Heterius*. The first specimens were observed by Mr. W. J. Fox, on March 30, 1891, and since then the writer has taken small lots at intervals of three or four days, covering a period of six weeks, the specimens gradually getting less abundant. The lower half of one side of the mound, which is almost perpendicular, is completely honey-combed by exposed galleries, and out of these occasionally one or two *Heterius* would suddenly make their appearance and roll to the bottom of the hill. Apparently the ants had carried these to the open ends of the galleries and uncereemoniously tumbled them out. A great many times ants were observed emerging from the galleries with *Heterius* in their jaws, which they would carry a short distance from the mound and drop, the ants returning without giving them any further attention. Nearly all the *Heterius* that were seen in motion, were intent upon entering the hill, but were usually bottled before they could do so. Sometimes the *Heterius*, when touched with a wisp of straw, would double up their members and drop, feigning death after the manner of other members of the family. At other times when touched they would display considerable activity, and although awkward and unwieldy in appearance could run along quite rapidly. An examination of small heaps of dead ants in the extreme corners of the table, upon which the mound had been placed, failed to discover the presence of any *Heterius*."

During the past April I repeatedly found specimens of *H. brunneipennis* in nests of *F. subsericea* near Bronxville, Westchester County, New York, but never in such numbers as reported by Liebeck. In most instances a colony contained only one or two beetles, more rarely from five to a dozen. In many of these colonies there were also numerous specimens of the little Silphid synœkete, *Ptomophagus parasita* Lec. April 12 seven *Heterii* were placed in an artificial nest with a number of *F. subsericea* workers and larvæ and kept under observation till June 30. The following notes show very clearly that the relations of these beetles to the ants are in several particulars unlike those described by Wasmann, Janet and Escherich for the European *ferrugineus*. Although the golden-yellow trichomes are scattered over the elytra and thorax of *H. brunneipennis* (Fig. 1) and not collected in masses on the sides and front of the thorax, as in some of the species from the Western States (*e. g.*, *H. tristriatus*), these structures nevertheless powerfully attract the ants. The beetles run about the nest with surprising agility, considering the awkward shape of

their body and legs, or stand motionless with the anterior part of the body elevated and the fore pair of legs raised from the floor, turned forward and strongly flexed at their femorotibial joints. When a beetle in this position happens to be touched by the antennæ of a passing ant, it begins to wave its fore legs as if to attract attention. The ant stops, begins to lick the beetle or seizes it with her jaws. The body of the latter being very hard and smooth slips from her

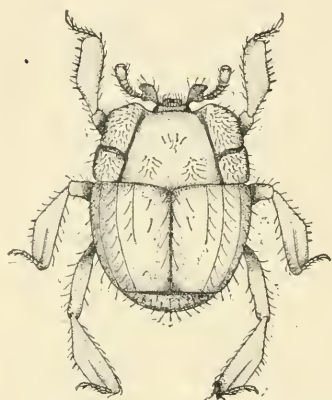


FIG. 1. *Heterius brunneipennis*
Rand. $\times 16$.

grasp but the ant redoubles her efforts. She either seizes it by one of its legs, since the beetle does not feign death and withdraw its appendages, but allows itself to be carried about the nest, or she stops, seizes it with her fore feet and, holding it in a vertical position, proceeds to lick its head in a very quick and effusive manner. For some time the beetle keeps its head withdrawn into its thorax, after the Histerid fashion, till the ant stops abruptly, protrudes her tongue and regurgitates a drop of food on its face. Then the beetle protrudes

its head, opens its mouth, works its jaws and rapidly absorbs the liquid which sometimes floods the whole cavity in the fore part of the thorax. Thereupon the ant again falls to licking the beetle as if to wipe its face free from the moisture and either leaves the creature to its own devices or regurgitates another drop. Again and again the licking and feeding may alternate as if the ant were fascinated with her pet and could not feed and fondle it enough. This performance is, in fact, so frequently repeated that I could nearly always observe it whenever I uncovered the nest. I have rarely witnessed a more comical sight than the behavior of these slender, black ants while they are holding the chunky, little, red urchins in their jaws and pouring liquid into them as if they were so many casks. Comical, too, is the behavior of the beetle while it is waiting to be noticed, with its head and fore legs elevated. At such times it assumes a ridiculous, cocky air and often, instead of receiving the caress and food which it is expecting, it is inadvertently knocked over onto its flat back by

some scurrying ant intent on more important business. Then the beetle lies for a few moments with sprawling legs but soon succeeds in righting itself and either scampers away or at once strikes its favorite attitude again. It seems to be greatly aided in the righting movements by the peculiar position of its tarsi, which are strongly flexed backward on the tibiae, so that when it is lying on its back, the claws are brought into the most advantageous position for taking hold of the floor of the nest.

Like the European *ferrugineus*, *H. brunneipennis* also feeds on solid substances. It eagerly seeks out any dead or wounded ants on the refuse heap of the nest and may be seen gnawing at their joints or mouth-parts or eating its way into the soft parts of the gaster after having made a large hole in the chitinous investment. It will also spend hours gnawing away with its sharp little mandibles at the bodies of caterpillars and other insects that have been partially eaten by the ants. Occasionally the body of a single small caterpillar or dead ant will be covered with the beetles, all busily feeding. At such times the ants often come up, tear them away and feed them with regurgitated food. The beetles straighten up and patiently submit to the fondling, licking and feeding, but as soon as the ants move away, return to their ghoulish repast.

May 31 I introduced two living *Thecla* caterpillars into the nest and observed them in the act of exuding droplets of liquid from the mouth-like orifice in the mid-dorsal line of their penultimate segment. The ants eagerly imbibed these droplets and, to my surprise, some of the *Heterii* crawled up onto the backs of the caterpillars, detected the gland and drank the exuding liquid. By the following day one of the caterpillars had pupated and had been deposited on the refuse heap, the other had been killed and reduced to a shriveled skin by the hungry ants. At this skin the beetles were busily gnawing when I uncovered the nest.

The beetles never made any attempts to leave the nest but seemed to be well satisfied with their board and lodgings. May 31 two of them were *in copulâ*, but no eggs nor larvæ were subsequently seen. Towards the latter part of June the beetles died off one by one till June 30, when only a single individual survived. On this date I was compelled to discontinue my observations.

The foregoing notes show that *H. brunneipennis* of the Eastern United States is a true symphile, since, unlike the European *ferrugineus*, it is treated with marked friendliness and is actually fed by its

hosts. That it nevertheless retains its synœketic habits intact is shown by its feeding on the insect refuse in the nest. These habits are probably very useful in enabling the beetle to live in colonies of indifferent or even hostile hosts. Schwarz and Wasmann have noticed the great development of the trichomes in the *Hetærii* from the Western States and have naturally concluded that these species are in all probability true symphiles. It is, indeed, probable that their relations to their hosts are even more intimate than those of our eastern *brunneipennis* to *F. subsericea*. If this should prove to be the case, the genus *Hetærius* would exhibit an interesting series of ethological stages, beginning with synœketes like the European *ferrugineus* in *fusca* colonies, passing into a sub-symphilic stage in this same species when living with *L. alienus* and exhibiting a more perfect symphily in *H. brunneipennis* and especially in the species of the Western States. Our meager knowledge indicates that the numerous other myrmecophilous Histeridæ that have been recorded by various authors, are mainly, if not exclusively, synœketes or synechthrans, that is, insects living in the nests of ants as indifferently tolerated or as persecuted intruders. These furnish an interesting subject for future observation and comparison.

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A SLAVE-MAKING FORAY OF THE SHINING AMAZON (*POLYERGUS LUCIDUS* MAYR).

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The following observations were made on the afternoon of July 21, 1903, during the session of the Yale Summer School of Forestry on the estate of Grey Towers, owned by Mr. James W. Pinchot, Milford, Pike Co., Pa. The slave-holding colony was situated within a few yards and down hill from the camp street, formed by two rows of tents, located on a sandy shoulder of the shale hills, rising in irregular terraces from the broad inner vestibule made by the Sawkill River before entering the gap it has cut through the western palisades of the Delaware River. The altitude of this shoulder or terrace cannot be over 900 feet above sea level. The terrace faces the east, is slightly mounded, and has an inclination towards the south as well. It is turfed in places, sandy in others, and towards the south becomes wet land and wooded. On the steep east slope the friable shale outcrops immediately, and it is near this point that the nest was located.

The workers who go forth to war are of one general color — a deep red, varying from mahogany to cherry red, almost a deep blood red in certain lights, and as shiny as chitin armor can make them. They are of the size of the black slave ant, *Formica fusca* var. *subsericea*, about one quarter inch long, and a little larger than the slave-maker I have usually observed, namely, *Formica sanguinea*, subsp. *rubicunda* var. *subintegra*, in North Brookfield, Mass.

My attention was called to them at 2:30 p. m., just as the army was crossing our camp street, going in a direction due WSW. The cloudy morning had given way to a noon of sunshine and heat, and now these ants appeared, a shining stream of blood red, swiftly slipping over the scant, gravelly turf, their chitin armor glistening in the hot sun like rolling jewels. They formed a living squadron with a width of less than five inches and a length of eighteen to twenty-four inches, regular enough in formation to be enclosed in a parallelogram of such dimensions. This doughty detachment, reckoned at 200 or more by three other observers who witnessed this part of the tactics

(Barrington Moore, Yale, '06 ; Robert Allen, Erie High School, '02 ; and Daniel G. Saunders, Harvard, '04), had left behind them only three or four stragglers in a distance of over a rod of the rear trail, and in the next ten minutes rushed on impetuously in a nearly straight line for eighty-five feet more.

The three or four stragglers could barely gain on the main column, for the latter was going at breakneck speed, without any advance guard or advance formation for driving in the enemy, as the *sanguinea* slave-makers do at a much lower rate of speed. Yet it was evident that the ground passed over was as well covered by this flying detachment as by the *sanguineas* with their mushroom-shaped advance, two to four feet in width. Neither species has been seen to ascend grass blades, but both swarm over flat leaves, low grass stubble, stones and rubbish accumulations, without paying much attention to the invasion of holes of nearby insects. Thus the stragglers were plunging along, heads down, just as fast as couriers (or, perhaps, badly frightened ants) ever go in the battles of the *sanguineas*, trying almost vainly to catch up.

The army passed directly over or across the edge of four hillocks of a smaller common ant, resembling *Prenolepis imparis*. The latter disappeared in their homes, and most of the swift-footed troop swept over their hill-tops. Yet a few always lingered to dig the *imparis* out. Thus four or five would set to work busily and excitedly excavating for foes, but two or three minutes later I saw them speeding on after the main troop. I surmise that the first stragglers I noticed may have fallen behind by pursuing similar fruitless quests. But it would be just as likely that the army set off before these stragglers had climbed out of the nest, and so were delayed in getting their bearings and following the trail. It is certain that it would be more difficult for belated ants of a *Polyergus* army to pick up the route than for *sanguineas*, for the latter are always meeting friends along the way who seem to act as an incitement to better speed, while these ants go in a close formation with a rear as compact as the van, leaving no guides *en route*, except scent. They seem to move just as close together as they possibly can and yet keep up top speed, even closer than the *sanguineas*, except when the latter are collecting in a crowd for the main assault.

Close to the goal, the army seemed to have come about a foot out of line from the direct route they had been following, making allow-

ances for slight deviations passing our tents, which delayed matters a little in their finding the entrances to the nest they were after. It was immediately noticeable when they stopped proceeding further southwest and began deploying for entrance holes. While we observers were still hunting for a nest, the soldiers seemed to be lessening in numbers until there were hardly two dozen left above ground, scouring the neighborhood in a general way over two square feet of ground. Just then, not five minutes from the time they reached this vicinity, a *lucidus* appeared with a pupa; thus giving the cue to the location of the nest holes. We quickly found the inconspicuous entrance under a tuft of grass at the side of a half-buried, flat, little stone. Down this one entrance the red ant stream had drained so quickly from view that it seemed hardly possible that the insects could have already located the nursery. Another ant followed close behind the first, then others and others, till the straggling, booty-laden, homeward caravan was at once noticeable.

The speed of this homeward column, now greatly lengthened out, was little less than the outward run. The soldiers stopped for nothing unless absolutely caught fast by obstructions. The remarkable speed in ants that are supposed to remain inactive most of each year, the lack of any pause to rearrange loads, as the *sanguineas* do, and the evident unerring instinct, struck all the observers as wonderful. Where did they store up so much untiring, indomitable energy without great exercise in preparation for it? The need of athletics in the social organization of the ants is not evident. These insects are ready for extreme exertion after eight to ten months' rest, although in the case of the queen ants we know that the wing muscles at least quickly degenerate.

About 2:43 to 2:45 p. m., the first booty-laden soldier started homeward. About 3:05 to 3:10 p. m., when the column had been streaming into the home citadel for ten minutes, apparently the last burdened ant was a rod away from the captured nest. If the expedition start be taken as 2:20 p. m., the last ant would have been over half-way home at 3:20 p. m. So the real work of the expedition was done within an hour, and the time limit for the complete operation, including the last ant, scarcely exceeded an hour.

There seemed to have been no fight. Two very much excited workers appeared around the entrance of the captured nest, evidently the species inhabiting that nest. They are larger than the slow-mov-

ing *Aphænogaster fulva* and lighter colored — black abdomen and a lighter red-brown head and thorax — but considerably smaller than the black, slave ant, *Formica fusca* var. *subsericea*, and slenderer.*

Perhaps the most interesting part of the foray was the return of the army to the home nest. At 2:55 p. m., the slaves, of a species like that captured, were excitedly and swiftly bringing out excavated earth at the home nest, while two or three amazons ran slowly about among them. Thus not all the soldiers of a nest go on a given foray.

The returning train of *Polyergus* became slightly mixed up in crossing the wagon road; the ants starting exactly NE, thus getting off the trail which angled to the right at that crossing, then returning nearly to the edge of the road where they started to cross, taking an ESE course which soon intersected the trail they sought. Having crossed at last they seemed to get off the trail again and beat about until into a NE direction. The succeeding ants gradually straightened out the trail till it led directly across the road and then on NE, evidently the way they had first traversed that bit of country. But there continued to be a slight confusion at the turn of the trail to cross the road. It occurred to me later that a wagon may have crossed this trail between the crossings of the in- and outgoing trips, which would of course obliterate the scent at the shallow wagon ruts. On the other hand, the *sanguineas* often get mixed up at the angles or turns they sometimes make in their trails. It seems as if this pointed to the probable limitations connected with a scented trail, for the ants seem to get a general direction in mind despite their little twists and turns to avoid obstacles and do not quickly appreciate a turn in the trail. The only refutation of this that I can think of is that the first ants that scented the trail may have faltered here in their direct advance and thus caused confusion to all succeeding individuals, — another possible limitation to the scent method of trailing.

After the trouble of finding the place to cross the road, there were two amazons with young ants in their jaws that kept in the lead by about two or four feet all the way. One of them ran straight into the nest entrance and the other ran shy about four inches to the NE of it before she quickly oriented herself and also quickly disappeared down the hole. Apparently not until four or five had arrived did the news of the success of the expedition spread. Thus it does not always happen

* The ant referred to by Mr. Burrill was evidently *Formica schauffussi* Mayr, which is the normal slave of *lucidus*. — EDITOR.

that the slaves go at once to meet the returning party, as I understand Professor Forel observed. It seems more in accordance with the idea of food-getting instincts that no great number of slaves should be interested in the expedition until they see the booty begin to come in, when many ants are stimulated to go out and get more from the same rich mine. Of course the quick return of the army prevents their going so far as the pillaged nest.

After the arrival of the first four or five amazons, the attitude of the slaves changed radically, they seemed to lose their heads completely, beginning to drag in large pebbles as if they too wished to share in the home-bringing of booty. However, I saw no pebbles finally taken into the nest. A few slaves and also three or four soldiers ran up the trail meeting the home-coming train and seemed to express joy (or excitement) rather than solicitous attention in their active antics. I saw none relieve others of the home-coming stream. From now on the amazons began to arrive in close succession, often two or three abreast, and plunged straight down the entrance of the home nest. At the same time an increasing number of the red ants and their slaves began to come to the surface. The hole, only about half an inch in diameter, soon became so crowded as to be nearly stopped up. Then I saw an amazon drop her burdensome pupa to stroke her antennæ and an outcoming amazon worker picked up the pupa and took it in, hence certainly relieving the former ant of her load. This was the beginning of a considerable change in the actions of the amazons. Up to this time no ant engaged in the expedition had been seen to stop to clean herself, the way the *sanguineas* so often do on the march, and no ant had been seen to relieve another at her work; but, with the choking of the home gateway, this exhibition of the above traits in the slave-making instincts became apparent. Two or three other amazons now stopped also to clean themselves and deposit their loads for the moment, and doing so near the entrance amidst the gathering of the greater crowd, served completely to block further expeditious work. Loose pupæ and a few larvæ were kicking under foot among the many, busy, shoving amazons and slaves. As only a few of the amazons returned without young ants, the amount of plunder was judged to be about 120 pupæ and 60 larvæ. In this condition I left them, unfortunately having to attend the school lectures.

After supper, D. G. Saunders, Jr., one of the other observers, and I measured the distance between nests as 175 feet. As we found

the amazons half-way to the pillaged nest, and they accomplished the remaining distance in ten minutes, we judged that they must have traversed the first half in ten minutes, for although the first half was uphill, it was much smoother travelling than the latter or downhill half which led through the grass. So twenty minutes seemed a fair calculation for the outward trip. This is eight and three fourths feet a minute or one and three fourths inches a second, as compared with Dr. Forel's calculation of one and one half inches a second. (Things go swifter in America!) As the ants returned heavily laden at a scarcely lessened speed, we may suppose that they were certainly good for an hour of such speed without burdens, or 525 feet in an hour. This is $525/5,280$ mile an hour or .1 mile. This would be about a mile a day of say twelve hours travel during the warm weather. The *bashi-konay* or army ant of Africa is said to advance about as fast as a man can walk, which seems slightly exaggerated, but if true, is certainly at a much greater speed than these ants display.

Compared with man, the ant may be said to be about a quarter inch long as against six feet or $288/4$ inches for man. Then, roughly, a man would have to travel 288 times as far as an ant in the same hour, or 288×525 feet (151,200 feet) or $28\frac{7}{11}$ miles an hour, a gait too rapid for most athletes! If the comparison had been made on the basis of comparative bulks or weights, it would be immensely more disproportionate to man's abilities.*

Now this human test of $28\frac{7}{11}$ miles an hour is not on level ground, but to imitate climbing grass stalks, leaves, pebbles, etc., would be for man a cross-country run over fences, hillocks, boulders, etc., uphill half the way and downhill the other half.

Further notes on the condition of the colony after the foray and during the succeeding days are summarized as follows:

At 6 p. m. no amazon was outside the nest; six slaves were bringing out earth at their accustomed nervous rate; and two *lucidus* queens—large, mahogany-red, winged, female ants—came out, sunned themselves a moment, and returned. The pillaged nest was wholly deserted.

* I did not see Professor Forel's figures until the last week of April, 1908, as given in W. F. Kirby's "Marvels of Ant Life," p. 17, where he gives the speed as $1\frac{1}{2}$ inches a second, or for man 22 miles an hour, evidently reckoning the average man at 5 ft. $4\frac{1}{2}$ in., which seems to me as much too low as my standard 6 ft. may be too high.

July 22, 10 a. m., the next day. One amazon out and about. Slaves at work but so few engaged that there was nothing to indicate a slave-keeping nest unless it were the size of the mound. Even the amazon was off the nest, and might be mistaken for some stranger ant. The mound was about three inches high with a diameter of six inches counting the entrance as a center, but was not circular, being on sloping ground and therefore in a three quarters circle plan.

Noon. The colony with the east exposure of its nest to the hot sun, was celebrating its nuptial flight, though the breeze was rather heavy and gusty. Possibly one female flew away of the large winged ants in sight, only two or three in number; but over half a dozen males flew away, and I left as many more ready to fly when I went to lunch. The males were quite unlike the females, being almost jet-black, only about half as long and many times smaller than the females. The thorax was noticeably thick, high, and black. The males were very active, frisking about much more actively than the females or workers, straddling each other's backs, but in one case only, trying to mount a female. She, however, objected, turned about and crawled down the entrance. The males sometimes amused themselves by chasing each other up grass stems and "fighting", kicking and grappling each other for right of way just out of pure frenzy.

1:15 p. m. None of the males were about, but large, heavy females were out and flying away. I saw five fly off, and counted as many more getting ready to go when I left. They were like large, juicy, glistening red currants, floating away in a scintillating blurr of wings. They did not fly upward in circles, but rose with one or two zigzags and then went directly either east or west, east bearing toward the valley and west toward the higher hills. This leads me to ask if the males of this species swarm before the females as a rule?

Some of the slaves climbed grass stalks after the sexed ants, giving them a parting brush, or, seldom, a gentle tug downward as if to dissuade them from leaving. Many more ran about on the ground. Three or four amazons were out and less active, having almost nothing to do with the sexed individuals. But perhaps the most interesting thing to note about the nuptial flight was the almost complete suspension of excavating activity, only about six earth pellets being brought out by the very large number of slaves on the nest during the half hour they were under my observation. Quite in contrast with this was the great increase in the amount of food being brought in.

It was rushed right down the nest hole, over amazons, slaves and sexed ants. One arrival was a fly; another a round, green bug about three eighths of an inch long, being convoyed by four slaves; and another a worm an inch and a half long under control of three others. Of the latter three, each seemed to be desirous to bring it in alone as her particular booty. At one moment, one slave suddenly and swiftly backed up a grass stem with the worm dangling in mid-air with her chief competitor dangling from the worm, while the third ant was left on the ground till the others came down again. But the second had not been gotten rid of so easily by this act, for she continued to hold on desperately.

August 11. Up to this date, when camp was broken, the ants did not go out on another slave raid so far as I could discover, although I kept daily watch on them except in stormy weather. However, a few amazons were seen outside of the nest on a few occasions. A few more fitful indications of swarming took place, two or more winged ants being out this day, but none were seen to fly away. The swarming above noticed (July 22) followed so soon on the heels of the slave raid (July 21) that I am inclined to ask if the time of swarming can be conditioned by a slave raid, or attendant to it? Further, what has the sudden foray to do with the swarming instinct? One thing seemed to me fairly clear — that after as successful an expedition as the one here described this species of ants does not foray as frequently as the *sanguineus*, which would seem to indicate a quicker satisfying of this interesting instinct.

NOTES ON NORTH AMERICAN SPECIES OF CRASSISETA V. ROS.

By C. F. ADAMS,

FAYETTEVILLE, ARK.

At various times the species of this genus have been catalogued and listed under either *Crassiseta* or *Elachiptera*, and of late American students have considered these two generic terms synonymous, giving the latter priority. Bezzi (*Contribuzione alla Fauna Ditterologica Italiana*, I, pp. 33-34, 1895) reserves the name *Elachiptera* for *brevipennis* Mg., and *Crassiseta* for the remaining species. The Ital-

ian species of the latter genus he groups in two subgenera, based largely on the structure of the scutellum and the arista, and on color. On examining European specimens of Meigen's *brevipennis* I think it deserves generic separation from the other species, and that Bezzi is correct in placing it under *Elachiptera* Macq.

The following table contains the known North American species, together with two which are considered new.

1. General color yellow or reddish yellow.....2
General color black.....3
2. Mesonotum with three longitudinal black lines.....*eunota* Lw.
Mesonotum with two lines.....*attenuata*, new species.
Mesonotum without longitudinal lines.....*flavida* Will.
3. Head, except sometimes the antennæ, wholly black.....4
Head more or less marked with yellow.....5
4. Scutellum without small tubercles.....*nigricornis* Lw.
Scutellum with small tubercles.....*nigriceps* Lw.
5. Dorsum of abdomen red, with brown margins.....*formosa* Lw.
Dorsum of abdomen black.....6
6. Mesonotum with two longitudinal lines composed of grayish yellow, microscopic hairs.....*bilineata* Adams.
Mesonotum without such lines.....7
7. Shining, second costal segment incrassate.....8
Subshining, second costal segment at most but little thickened.....*langula* Lw.
8. Scutellum with tubercles.....*costata* Lw.
Scutellum without tubercles.....*penita*, new species.

***Crassiseta attenuata*, new species.**

Head yellow, frontal triangle shining, nearly reaching antennæ, ocellar dot black; sides of front and face with faint tinge of silver; upper margin of antennæ and arista black; latter broad but rapidly attenuated on outer third. Thorax yellow; mesonotum with two sublateral, black lines; scutellum without tubercles. Halteres yellow. Abdomen shining black. Legs yellow, infuscated on tip of tarsi; the right hind tibia is swollen and black, but this is probably pathological, or in some other way abnormal. Wing with a tinge of brown. Length 3 mm.

One specimen from San José de Costa Rica, collected by Prof. P. Biolley.

***Crassiseta penita*, new species.**

Head black; front yellowish anteriorly, frontal triangle large, shining; occiput slightly grayish pruinose, triangle projecting downward from vertex, shining; antennæ reddish yellow, arista black; mouth parts tinged with yellow. Thorax shining black; mesonotum scrobiculate, except laterally and on two subdorsal ridges anteriorly; scutellum scrobiculate, without tubercles; halteres yellow. Abdomen shining brownish black, anteriorly tinged with yellow. Legs reddish yellow; tibiæ and tarsi fuscous, the anterior tarsi being dark brown. Second costal segment of wing only slightly incrassate. Length 3 mm.

Two specimens from Wisconsin.

ANNOTATED LIST OF THE DIURNAL LEPIDOPTERA OF SAN DIEGO COUNTY, CALIFORNIA, BASED ON COLLECTIONS DURING 1906 AND 1907.

BY W. S. WRIGHT,
SAN DIEGO, CALIFORNIA.

In the following paper I attempt to give a list of the known butterflies of San Diego County with notes on my personal observations. A complete list would be impossible under the circumstances, and this is offered as a nucleus for a fuller, more complete one to be prepared at some future time as further explorations and collections shall add to our knowledge.

Since the territory covered by my collections lies wholly within the lower austral life zone a discussion of life areas is not attempted.

In the spring of 1906, Mr. George Field and myself began a systematic collection of material for this paper. At first our efforts were confined to the immediate vicinity of San Diego city. A large amount of material was collected and mounted. A casual study showed that the region is full of interest to the student and that there are many species not previously credited to this locality. This fact led us at once to extend our territory to include the whole county as nearly as possible. Being unable to visit every portion of the county during the best collecting seasons, we were very fortunate in having the considerable collections of Mr. and Mrs. Frank Stephens for reference and comparison. This material has been collected at various times during the last fifteen years and much of it came from localities that our limited time made it impossible for us to visit.

In July, 1906, we collected over a strip of territory approximately twenty miles wide along the Mexican border from the ocean to the edge of the desert. On this trip we took some twenty-five hundred specimens among which we found one new species since described by Dr. Henry Skinner as *Thecla loki*.

In 1907 Mr. Field went over the same ground and then made a detour to the north, visiting the mountains about the Cuyamaca. Many interesting "finds" were recorded, among them *Thecla ines*,

which has been called "the child of the desert." Our record, however, shows that its habitat is not confined to strictly desert regions.

The sequence of the following list is in accordance with that of Bull. 52, U. S. N. M. The numbers in parentheses refer to the numbers of that list. W. G. Wright's "West Coast Butterflies" has been our principal guide in identification. Some doubtful species have been referred to Dr. Skinner and others.

1. **Papilio eurymedon Boisduval (9).**

This beautiful swallow-tail may often be seen in the early morning floating leisurely along over the flowers and shrubs in the cañons. It is not very common in any one place but is found all the way from the coast to the mountains.

2. **Papilio rutulus Boisduval (10).**

In the summer of 1906 this butterfly was particularly plentiful. I took a few specimens in the vicinity of San Diego early in the spring and later, in July, I captured them in large numbers at Barret's Dam, back in the mountains. It is common wherever the willow grows. Mission Valley, in the immediate vicinity of San Diego, is a good collecting ground for this butterfly during its season.

3. **Papilio zolicaon Boisduval (18).**

From early spring to late summer this beauty sports about on the hillsides in its favorite haunts. In September its larvæ may be found feeding on a species of wild carrot that grows plentifully in waste places. It is said to be very abundant in April on the Coronado Islands about twelve miles off the coast, though I have never collected it there.

4. **Laërtias philenor Linnæus (23).**

Very rare. One specimen was taken by one of my school boys in the City Park near Date Street during 1906. So far as I know this is the only record of one taken in San Diego. I am told that the larvæ were imported some years ago from San Francisco by Mrs. Katherine Brandegee. Its food plant — *Aristolochia californica* — is not known here except in cultivation.

5. **Pontia protodice Boisduval & LeConte (37).**

I have seen this little "white" in great numbers in this city during the early summer and have taken it sparingly in the back country in July.

6. **Pontia rapæ Linnæus (40).**

This pest is common here as it is everywhere in the United States.

7. **Nathalis iole Boisduval** (41).

Not a rare insect in this locality. It may be found in May and June in Switzer's Cañon in the city. It also occurs throughout the back country and in the mountains up to 3,500 feet altitude. *Iole* flies low and is usually found in some dry, stony place or flying along the road or path. Its flight is rather swift but as it always flies in a straight line it is not very difficult to capture.

8. **Synchlœ cethura Felder** (47).

I have taken but few specimens of this butterfly in the immediate vicinity of San Diego. There seems to be no particular place where it may be found, but it may be seen in cañons and on the higher ground as well during late spring.

9. **Synchlœ reakirtii Edwards** (49a).

Mission Valley seems to be the metropolis of *reakirtii* in this vicinity. During the spring of 1907 it flew there in thousands. It may be taken also in almost any cañon about the city. *Sara* is said to occur at Pacific Beach (Wright's "West Coast Butterflies"), but I have never taken it there or anywhere else in San Diego County.

10. **Callidryas eubule Linnæus** (52).

Eubule is quite common about flower gardens. There seem to be two forms of this butterfly in this region. Among the males a few are found that have a considerable number of spots on the under side of the wing, and there is occasionally found an individual having few or no spots at all. Mr. Wright, in *West Coast Butterflies*, assigns the former to the species *sennæ* Linnæus, of which he says: "Taken by me at Mazatlan on the west coast of Mexico; it is not known in this part of the country, but is liable to be found at Yuma and along the Colorado River, if there is any plant there for it to feed upon." The greater number of specimens taken about San Diego are referable to *sennæ* provided that the specimen figured by Mr. Wright represents a valid species. I am informed by Mr. Victor L. Clemence, of Pasadena, that he has taken a specimen of *sennæ* at that place. Albinistic females are found occasionally but are not common in this vicinity.

11. **Zerene eurydice Boisduval** (60).12. **Zerene bernardino Edwards** (60a).

Both of these forms have been taken by me in the city of San Diego. In July, 1906, I took both also at Cottonwood Creek in the

mountains. Neither form seems to be plentiful in this region though they cannot be said to be rare. *Amorpha californica*, on which the larvæ feed, grows quite plentifully in Mission Valley.

13. **Eurymus cæsonia Stoll** (61).

One fair specimen was taken in Devil's Cañon, near Jacumba, during July, 1906, by Mr. Geo. Field. So far as I am aware, this is the only specimen ever taken this side of the desert. It should occur along the Colorado River in what is now Imperial County.

14. **Eurymus eurytheme Boisduval** (65).

15. **Eurymus ariadne Edwards** (65a).

16. **Eurymus keewaydin Edwards** (65 syn.).

These species are quite confusing to the amateur and I am not at all clear in my own mind about them. The form *eurytheme* occurs only late in the season, *ariadne* occurs only early in the season, and *keewaydin* may be found from early spring to late in the fall. During 1906 I captured and spread some 150 or more specimens of these species and on close study found that they intergraded so closely that it was practically impossible to say where one form ended and the next began. Of *ariadne* I had but three specimens of which I was certain; of *eurytheme*, less than twenty, while all the rest were either *keewaydin* or intergrades. The latter were taken as early as March 10, and as late as November 10. In 1907 I took one *keewaydin* on February 9. Wright's "West Coast Butterflies" has been my guide in separating these species, and I am inclined to think with him that *keewaydin* is the stem of the species and that *eurytheme* and *ariadne* are but varieties. Albinistic females in both *eurytheme* and *keewaydin* were very common during 1906, but I have not seen so many this year.

17. **Eurymus harfordi Hy. Edwards** (67).

One of the commonest butterflies to be seen in the mountains of this region is *harfordi*. In July, 1906, we saw it in thousands flying among the brush on the hillsides, along the river banks, on the mesa, in fact, it seemed to be everywhere. It is a difficult insect to catch. It is swift in flight, seems to be very powerful on the wing and is seldom seen at rest. We were able to get but few, though at times the individuals were so plentiful that we took them from the wagon while traveling.

18. **Pyrisita mexicana Boisduval** (81).

So far as I know but two specimens of this species have been

taken in this region of late years. Mr. Geo. Field took a pair at Lakeside in the spring of 1906.

19. **Eurema nicippe** Cramer (83).

Nicippe is said to be quite common during the summer in the mountains; however, I do not know this from my own observation. It is not at all common on the coast, though single specimens are sometimes taken.

20. **Agraulis vanillæ** Linnæus (91).

In the fall of the year this butterfly may be seen in considerable numbers wherever the passion vine is grown. It is quite variable in size in this locality.

21. **Argynnis callippe** Boisduval (116).

I have never taken *callippe* in anything like large numbers in this locality. Whatever specimens are taken here are probably strays. It is undoubtedly a valley butterfly but its home is probably back from the coast some distance though at no great elevation. About a dozen specimens have been taken here in the last two years.

22. **Argynnis semiramis** Edwards (124).

During the year 1906 I took a few specimens of this species in a little valley some ten miles east of Campo. It was also taken in considerable numbers at Morena Buttes. Mr. Geo. Field tells me that he saw it in hundreds on Volcan Mt. this year. It was found for the most part on the tall brakes and ferns that abound in that locality.

23. **Lemonias chalcedon** Doub. & Hewit (148).

I have but two specimens of this butterfly taken in Switzer's Cañon in the eastern part of the city during 1906. Early in the spring of this year one of my school boys took two females on the hill just above the bridge that crosses this cañon at University Ave. These are all that I have seen in two years.

24. **Lemonias quino** Behr (154).

There is some difference of opinion in regard to this species on this coast. It is published in Wright's "West Coast Butterflies" as *Melitea augusta* Edwards; however Mr. Fordyce Grinnell, who has studied the species from specimens furnished by me, has pronounced it *L. quino* (vide Canadian Entomologist, Vol. XXXIX, p. 380). *Quino* (?) occurs in this locality in great numbers during the early spring. An occasional aberration (*M. augustina* Wright) is found among the males. Two were taken in the spring of 1907.

25. **Lemonias gabbi** Behr (167).

Common during its season (spring) in the cañons about the city. It likes to fly close to the ground along the dry washes in the bottom of the cañon and is comparatively easy to capture.

26. **Thessalia wrighti** Edwards (176).

Rare. July 4, 1906, I took two females at Jacumba. One male was taken near the city some time in June. Early in July of this year Mr. Geo. Field took two female specimens at Jacumba. So far as I am aware these are the only records for San Diego County.

27. **Chlosyne californica** Wright.

This is also a rare species. I have one specimen taken July 4, 1906, in a small cañon between Jacumba and Mountain Springs. It is properly a desert species.

28. **Polygonia satyrus** Edwards (207).29. **Polygonia satyrus marsyas** Edwards (207a).

Wright says: "The West Coast Graptas (*Polygonia*) appear to go in pairs of species or that two similar species of each type are found, these two closely resemble each other, and being widely different from any others." This will probably account for the finding of the above two (?) species last summer in the willow copses near Campo. They were also seen at the foot of Volcan Mt.

30. **Eu Vanessa antiopa** Linnæus (217).

Common here as everywhere. Where willow grows there *antiopa* abounds.

31. **Vanessa atalanta** Linnæus (219).

This cosmopolitan is found but sparingly throughout this region. An occasional specimen may be taken in the cañons, but it is rather difficult to capture.

32. **Vanessa huntera** Fabricius (220).

Quite common in the cañons about the city. It may often be found flitting about some dry, barren spot near a bush or tree on the brow of a hill. In such places it is easily captured. When flying through the weeds or among flowers it is wary and not easily taken. It occurs sparingly in the mountains.

33. **Vanessa cardui** Linnæus (221).

Very common throughout the region, occurring in early spring and late summer. During the spring of 1907 large numbers were seen

flying through the city in a northwesterly direction. The flight continued for several days.

34. *Vanessa carye* Hübner (222).

The "California painted lady" is to be seen in some numbers as early as February and continues to fly until cold weather. The larvæ may be gathered as soon as *Malva rotundifolia* begins to put out its leaves. It is easily bred and has many generations in a year.

35. *Junonia cœnia* Hübner (223).

One of the commonest butterflies of this region is *cœnia*. It is abundant from the coast to the tops of the mountains. Mrs. Katherine Brandegee reared it in considerable numbers from larvæ gathered at Cuyamaca Lake at an elevation of nearly 5,000 feet. *Cœnia* has been considered a valley butterfly (West Coast Butterflies), but this record will place it among the mountain species as well.

36. *Basilarchia lorquini* Boisduval (242).

This beauty may be found among the willows along the water courses from the coast to the mountains and is quite common.

37. *Limenitis californica* Butler (243a).

Very abundant about the oaks back from the coast. It is also found occasionally in the valleys near the coast. Among the oaks it is a high-minded creature, keeping well toward the tops of the trees out of harm's way, and is therefore rather difficult to capture. It is pugnacious and will fly after anything that comes too near; it will follow clear to the ground a stick or stone that is thrown into the air. In this way the insect may often be brought within range of one's net.

38. *Cercyonis paulus* Edwards (262).

Common under the oaks at an elevation of about 2,000 feet or higher. It also occurs sparingly amongst the brush on the open mesa.

39. *Cœnonympha californica* Doub. & Hewit (279).

This is a very confusing species; it is also a very common one. Wright figures five forms, ranging from San Diego County to Mendocino County all of which "are very much alike, being, perhaps, seasonal or local subspecies or varieties of the same stock, being similar on the upper side, and only minor differences appearing on the under side, and all the features are in good degree variable, and merge into one another. . . . *Californica* is sometimes called the summer form. I would rather call it the northern form, as it is com-

mon in central California but does not appear in the southern part of the state at all."

The species interested me and during 1906 I took and spread over 200 specimens between February 15 and September 1. The darker forms, perhaps, predominated early, though I took as dark specimens in July and August as in February. The ocelli varied from none at all on either wing through all the combinations to the characteristic two on the primaries and six on the secondaries, and a few had twinned spots on the outer angle of the primaries. The colors ranged from buff to deep yellow and from light gray to almost black. Nearly every species except *pulla* that Wright figures in his book was easily distinguishable. Wishing better authority than my own judgment, I sent a representative series to Dr. Henry Skinner who pronounced them *californica* without comment. Dyar, in Bull. 52, U. S. N. M., recognizes but two forms, *californica* and *pulla* — Smith's list adds *galactinus* to the list of forms; but I am inclined to think that all the species of Wright's list, with the exception of *pulla*, should be relegated to the synonymy of *californica*, as Dyar has done. In this county, *californica* ranges from tidewater to the mountains, being very plentiful at Witch Creek at elevations of between 2,750 and 4,000 feet.

40. **Anosia plexippus** Linnæus (308).

Common throughout this region. A slight difference in the color of the four spots on the outer angle of the primaries is seen. In specimens taken on the coast they are light brown, almost white, while mountain specimens show the spots much darker, the color being decidedly brown.

41. **Anosia strigosa** Bates (309).

This form is common in this region from the coast to the desert. I took it in considerable numbers in the Sweetwater Valley near Dehesa during July, 1906.

42. **Chrysobia virgulti** Behr (316).

This little fellow flies in thousands about the wild buckwheat (*Eriogonum*) during the whole season. The later specimens seem to be a little lighter in color and the females a little smaller.

43. **Calephalis australis** Edwards (322).

Though not very plentiful in this locality, *australis* cannot be considered rare. It is most often found flying about in the brush border-

ing a stony wash in the bottom of a cañon. In Mission Valley it flies among the tall weeds quite plentifully during August and September. Its habit of flying close to the ground makes it a rather difficult capture.

44. **Habrodias grunus** Boisduval (327).

One specimen taken near Campo in July, 1906, appears to answer to the description of this species. However, the damaged condition of the specimen makes it a little doubtful. Taken in some numbers on Volcan Mt., July, 1907.

45. **Atlides halesus** Cramer (329).

Four specimens, three males and one female, were taken in Jacumba Valley during July, 1906. This is evidently the extreme western edge of its range.

46. **Uranotes melinus** Hübner (335).

Quite common about the city from late spring to late summer. One rarely sees more than one or two at a time.

47. **Thecla dryope** Edwards (343).

Very common along the water courses from the coast to the mountains. I have taken as many as twenty-five in half an hour, and during the spring of 1907 they were very thick on the flowers of *Amorpha californica* in Mission Valley.

48. **Thecla sæpium** Boisduval (354).

This fiery little fellow flies in great numbers about the greasewood from the coast to the mountains. It is particularly plentiful at the higher altitudes.

49. **Thecla adenostomatis** Hy. Edwards (356).

The only place in or near the city that I have ever seen this insect is in a cañon just west of the State Normal School. It flies in great numbers among the foothills back from the coast where *Adenostoma fasciculata* abounds.

50. **Thecla loki** Skinner, 1907 (not listed).

Mr. Geo. Field and myself took about twenty specimens of this butterfly in July, 1906, near Jacumba. It was flying about the Juniper trees at about 3,500 feet elevation. Dr. Henry Skinner has described it in an article published in Entomological News for November, 1907.

51. **Callicista columella Fabricius** (366).

Only five of these little beauties have fallen to my net in the last two years, and these were taken on the alfalfa blossoms in my front yard in August, 1906. The species may be more plentiful back from the coast.

52. **Callicista ines Edwards** (369).

In July, 1907, Mr. George Field was collecting at Jacumba and took a number of these desert beauties. They seemed to be quite plentiful but owing to the short time he was there he failed to get a very large series of them. This is the most western record for *ines* that I have been able to find. The locality is semi-desert and is subject to the same general climatic conditions as the desert only a few miles away, and one would naturally expect to find *ines*, if at all, at the same time as farther east, viz., October, but here we find it plentiful in July. I believe, therefore, that we are safe in supposing that there are two broods, one emerging the latter part of June, the other in October.

53. **Incisalia iroides Boisduval** (372).

During the early spring of 1906 I took one specimen of this species in the city. It has been taken sparingly in other parts of the county but does not seem to be plentiful anywhere in this locality.

54. **Callophrys dumetorum Boisduval** (380).

San Diego specimens are somewhat smaller than those taken in the mountains, but the markings are typical of the species. Nine specimens fell to my net on the hill above Powder-house Cañon in the City Park during February and March, 1907. The species is said to be very abundant in San Felipe Cañon near Julian.

55. **Tharsalia virginiensis Edwards** (387).

This species occurs in the valley about midway between Campo and Jacumba where I have taken a few specimens. Mr. George Field took a large series of them on Volcan Mt. in July, 1907.

56. **Tharsalia hermes Edwards** (388).

This beauty may be taken sparingly in the cañons to the north and east of the city during June. It also occurs in the Grapevine Cañon at an altitude of about 2,500 feet. *Hermes* is a very delicate insect and difficult to capture in perfect condition. Mr. Wright, in "West Coast Butterflies," describes this as a new species under the name *del*

sud. He was unfortunate in having but a single much-worn specimen at the time from which to describe the species and may therefore be pardoned. But the original description by Edwards is so clear and the individuality of the species so marked that it seems necessary to relegate *del sud* to the waste basket of synonymy. I have taken *hermes* now for two years and have examined and studied nearly one hundred specimens—good and bad—and there is not the slightest doubt that it is *hermes* and not *del sud*.

57. **Gæides xanthoides Boisduval** (389).

Xanthoides occurs in the mountains and among the foothills in considerable numbers. It is easily taken and is probably most often found on the *Eriogonum*, or wild “buckwheat.”

58. **Gæides gorgon Boisduval** (392).

Gorgon is evidently a mountain butterfly, only an occasional one being taken in the lower valleys. In July, 1906, I took a few specimens in the mountains beyond Campo, and this current year Mr. George Field took it in some numbers on Volcan Mt.

59. **Epidemia helloides Boisduval** (396).

A common butterfly everywhere. Most frequently found about low damp places.

60. **Nomiades polyphemus Boisduval** (418 syn.).

This is the butterfly that is figured in West Coast Butterflies as “*Lycæna antiacis*.” Mr. Fordyce Grinnell, of Pasadena, however, has given much time to the study of the group and he assures me that it is *polyphemus*. It certainly differs much from the *antiacis* of the region of San Francisco where Boisduval’s types were taken.

61. **Philotes sonorensis Felder** (423).

Only three specimens of this beautiful little butterfly have been taken in this locality recently, one at La Jolla, one in this city and one at Lemon Grove. It is said to have been abundant some years ago in the cañons about Bonita in the Sweetwater Valley, and I am told that it has been collected at Point Loma.

62. **Rusticus glaucon Edwards** (428).

A very common little “blue.” It occurs in considerable numbers almost anywhere from the coast to the mountains.

63. *Rusticus battoides* Behr (429).

So far as I am aware but one specimen of this butterfly has been taken in this locality. It was taken by Mr. George Field at Jacumba in July, 1906. *Battoides* and *glaucón* may be quite easily confused by one not familiar with both, and I have seen at least one large series of *glaucón* that had been called by the former name. I am convinced, however, that the species most commonly found in this locality is *glaucón* and not *battoides*. That *battoides* does occur is quite certain, but I am inclined to the belief that it is confined to the more elevated regions back from the coast.

64. *Rusticus melissa* Edwards (431).

Melissa is a very common "blue" in this locality if you know where to look for it. Mission Valley is fine collecting ground for it. At Morena Dam, in July, 1906, it was so thick in a little valley near the dam that I took over a hundred specimens one evening after sundown, picking them off the grass with my fingers, no net being necessary. The specimens in Mission Valley are a little smaller than those taken in the mountains.

65. *Rusticus acmon* Doub. & Hewit (434).

At times *acmon* is very common here, though this year it has been rather scarce. It frequents the sunny hillsides, and is not uncommon in Mission Valley where it likes to fly about a species of *Hosachia*. It is quite variable in depth of color and also in size. Some specimens are almost as large as *melissa*. The larger specimens are usually considerably darker than the small forms.

66. *Cyaniris ladon* (var.).

One specimen taken in July, 1906, at Grapevine Cañon.

67. *Everes amyntula* Boisduval (441).

Amyntula is quite common in the cañons about the city, especially where the "rattle-weed" grows. I have also one specimen and Mr. George Field has two of a butterfly that has all the appearance of *amyntula* without the tail. These specimens were taken in a cañon just back of St. Joseph's Hospital and were supposed to be *amyntula* when taken.

68. *Hemiargus isola* Reakirt (444).

One somewhat damaged specimen taken at Jacumba, July, 1906.

69. **Hemiargus hanno** Stoll (447).

This little "blue" occurs sparingly at San Diego and is taken unexpectedly as a rule. It has much the same habit as *Leptoles marina* and will probably be called *marina* until closer observation discloses the three characteristic black spots at the base of the secondaries. It has a wide range — being taken all the way from the coast to the mountains.

70. **Brephidium exilis** Boisduval (450).

This is an interesting little species for besides being the smallest butterfly in this locality it is also the most plentiful. It is most abundant in July and August but may be seen almost every month in the year. Wherever the salt grass grows there you will find *exilis*.

71. **Leptoles marina** Reakirt (451).

From June to September *marina* may be seen flitting about the bushes in the cañons, on hillsides, and in flower gardens. The edge of an alfalfa field also presents fine possibilities for an enthusiastic collector. *Marina* is a very active insect and one is often disappointed that his specimens are not such as he would like for his cabinet, but a little perseverance will result in some fine captures.

72. **Megathymus neumægeni** Edwards (457).

One badly worn specimen was taken some years ago in Switzer's Cañon in the city park. So far as I know this is the only specimen ever taken this side of the Colorado desert. Mr. Frank Stephens has taken *neumægeni* in some numbers on the edge of the desert in this county. *Neumægeni* is a swift and powerful flier, and it is likely to lead an enthusiastic collector a lively chase.

73. **Copæodes wrighti** Edwards (476).

Wrighti is properly a desert skipper but may be taken sparingly in the mountains near the city. Volcan Mt. would be a good place to hunt for it.

74. **Anthomaster nemorum** Boisduval (506).

A common butterfly about San Diego during the early summer.

75. **Anthomaster pratincola** Boisduval (510).

Rather common during the early summer in and about the city. Some very fine specimens were taken May 30, 1906, at Point Loma.

76. *Hylephila campestris* Boisduval (512).

This is one of the larger "brown skippers" and, owing to the difference in appearance between the male and female, is somewhat confusing. It is common along low ground in the mountain valleys.

77. *Hylephila phylæus* Drury (515).

One is quite likely to take *phylæus* on lawns in the city, though its habitat is properly along some damp, grassy wash. It is the largest "brown skipper" in the immediate locality and is very common during its season, June to September.

78. *Polites sabuleti* Boisduval (525).

A very interesting form; evidently a coast butterfly as I have never seen it elsewhere than in San Diego city. Not very common.

79. *Prenes errans* Skinner (549).

Probably more plentiful than any other butterfly of this region during its season. In favorable localities along the bay shore it flies in great numbers. Some idea of its abundance may be gained when it is known that a collector can net two hundred in a couple of hours if he attends to his business. June to October.

80. *Eudamus proteus* Linnæus (577).

Until 1906 this species was practically unknown in this region. During the summer of that year it appeared in considerable numbers in the eastern part of the city. I took a few specimens in Mission Valley. It has not appeared again this year, 1907, to my knowledge.

81. *Epargyrus tityrus* Fabricius (584).

Tityrus is not common in San Diego. It is, however, occasionally seen in some almost inaccessible place in a deep cañon but is rarely taken. I have seen one in two years and know of two others having been taken.

82. *Thanaos clitus* Edwards (633).

Very common from tidewater to the mountains. In San Diego it is met with in almost every cañon. In the mountains it frequents the wild sunflowers in large numbers and is easily taken.

83. *Hesperia ericetorum* Boisduval (639).

Ericetorum is a strong flier and shy. It is rarely seen and more rarely taken. *Malvastrum thurberi* is its food plant and where this plant grows *ericetorum* is most likely to be found.

84. *Hesperia tessellata* Scudder (642).

Probably the commonest member of its family in this region. It flies from early spring until late in the fall and may be taken almost anywhere.

RECAPITULATION.

This list includes 84 species scattered through 54 genera. Of these, 61 species in 42 genera are to be found in the immediate vicinity of San Diego city.

Fairly good collecting may be had in and about the city as early as the middle of February and as late as the middle of November. The best months are March to September inclusive, and I judge that the same limits will apply to the mountains as well except at the higher altitudes. Probably the best time for a trip to the mountains would be in May, June, or July, while for desert collecting March or April would be the best months.

NEW NORTH AMERICAN TORTRICIDÆ AND TINEINÆ.

BY W. D. KEARFOTT,

MONTCLAIR, N. J.

Eucosma dorsisuffusana, new species.

Expanse 17.5-24 mm.

Head dark chocolate-brown, face blackish; palpi cream-white inside, dark bronzy-brown outside, apical joint short, obtuse, dark gray; antenna blackish gray, faintly annulated with whitish; thorax dark gray-brown mottled with ochreous brown; abdomen light fuscous; legs cream-white, shaded with ochreous brown and dark brown.

Forewing. — Inner third and upper half transversely strigulated with grayish brown and black, with a shade of bright brown between the black lines before the dorsal spot and on the outer half of costa. The lower half of wing, from inner third to termen is cream-white, the usual dorsal spot running into the white ocellic area, the latter reaches to within a quarter of the costa, and is rounded on top; the brown ground color sharply defines this white area and by an angulation downward at outer third outlines the upper side of the two spots. Before the ocellic space are a few dark brown scales on the white ground. Between middle and apex the costa is marked with five pairs of outwardly oblique cream-white dashes, each ending below costa in a few light blue metallic scales, from the second pair before apex the line of metallic scales continues to termen, a third below apex; between these costal

streaks the ground color is bright ochreous brown, this shade narrowly margining upper half of termen. There is a small white dot on termen immediately below apex. Cilia on upper half light ochreous brown, mottled with darker brown and gray, with a few black scales in apex, the lower half, opposite white ocellic area, is white.

Hindwing.—Light smoky brown, cilia cinereous, preceded by a gray line; underside the same. Underside forewing darker smoky brown, costal spots faintly repeated.

Ten specimens, Cincinnati, Ohio, June 6–23, Miss Braun; Pittsburgh, Pa., July 3, Henry Engel. Cotypes in Merrick Museum, Miss Braun's and my collections.

This species is like *similana* Hbn. (Europe) and has been frequently so named. The wings are narrower and the arrangement of costal spots and dorsal patch different. In shape and general appearance *dorsisuffusana* is more like *otiosana* Clem.

***Eucosma medioviridana*, new species.**

Expanse 16–17 mm.

Head, palpi, antenna and thorax light mouse-gray; apical joint of antenna blackish brown; abdomen light fuscous; legs whitish, shaded with gray in front.

Forewing.—Outer two thirds pale apple green, inner third conspicuously darker. The basal area at middle of wing extends to inner third, its outer edge is a black line, obliquely outward from costa to middle, thence inward to dorsum with an indentation between fold and dorsum; there is an inwardly oblique line in the middle of this space, beginning at costa and ending below fold, this starts as outwardly oblique on the ♂ costal fold, then turns inward. Between costal fold and lower median vein, is overlaid with darker apple green, on a dark gray ground, below it is mottled gray and brown, this is succeeded in the outer half of the basal area by a patch of light ochreous brown, widest on dorsal margin and tapering to a point at upper third. Beyond the basal area the balance of wing is pale gray, more or less heavily overlaid with pale apple green, this color is most pronounced in the middle third of wing. It is traversed by faint irregular darker lines from the costa; two from beyond middle of wing enclose an obscure narrow dark gray fascia to tornus; half way between this and an apex an irregular line circles the outside of ocellic space, the latter is not defined. Cilia dark gray.

Hindwing.—Brownish gray, underside the same; underside forewing dark smoky gray.

Six specimens, Ottawa, August 17–21, C. H. Young; New Brighton, Pa., August 25 to September 11, H. D. Merrick and Henry Engel. Cotypes in Merrick Museum, Young's and my collections.

This species, in the shape of the wings and general markings, is very similar to *pulsatillana* Dyar, it can be separated by the green shading, which is absent from *pulsatillana*; I would place it between the latter and *nisella* Clerck.

Eucosma engelana, new species.

Expanse 14-17 mm.

Head, palpi, antenna, thorax, abdomen, legs and forewings pale terra-cotta brown. The inner sides of palpi are slightly paler, also hindwings are of a lighter shade.

Forewing. — A faintly darker basal shade, its outer edge from inner third of dorsal margin obliquely upward and becoming obsolete near costa. Before tornus is the only conspicuous mark on the wing, a darker brown quadrate spot, resting on dorsal margin and disappearing before middle of wing. The intervening space, between it and basal area, and also the ocellic area is slightly paler than the balance of wing. On the outer half of costa are several faintly darker outwardly oblique dashes, the one before apex is inwardly oblique. The intervening spaces paler.

Four specimens, three ♂ from Pittsburg, Pa., August 20 and September 2, Henry Engel; one ♀ Great Notch, N. J., 800 ft. elevation, May 21, 1899. Cotype in Merrick Museum, and my collection.

This species is very much like *dorsisignatana* Clem., and I have long considered my ♀ specimen as a very pale or bleached form of this species; recently, when at New Brighton, Mr. Engel showed me three ♂ specimens and insisted they were distinct from any of the varieties of *dorsisignatana*, in which opinion I entirely coincide, after additional critical comparison, and take pleasure in naming the species after this most careful worker.

Eucosma galenapunctana, new species.

Expanse 17-24 mm.

Head ochreous cream, darker in front; palpi with small rounded flattened brush on second joint, apical joint short, exposed, color ochreous cream, outer end of brush and apical joint leaden-gray; antenna finely ciliated in male, ochreous cream faintly annulated with gray; thorax same shade as posterior end of head; abdomen grayish white becoming darker at anal end; legs creamy white, dusted with brown.

Forewing. — Male costal fold about one third length of wing, narrow, appressed, costa nearly straight beyond base, apex obtuse, rounded, termen very slightly concave; venation both wings typical, pale ochreous-cream, with horizontal rows of blackish leaden dots, in certain light these dots are black, in others no trace of black but shining gray, when rubbed the dots are more or less obsolete and of a brownish shade; the costa is narrowly dotted on the inner half with light to blackish brown, on outer half the dots become outwardly oblique brownish streaks, separated by whitish lines, the latter in outer third connect below with shining streaks that run into the vertical bars on each side of the ocellus. On the inner third of wing, between costal edge and upper vein of cell, is a streak almost free from these dots; between the clear streak and fold are three rows, below the fold are three or four irregular and broken rows. The ocellus is on a cream ochreous field, with a strong inner bar and a broken outer bar, between which are three fine horizontal black lines, the two upper ones are longest, they all touch the inner bar and in some specimens the inner end of the black lines are enlarged. Costa whitish ochreous, speckled with black at base.

Hindwing. — Pale fuscous, darker around margins, underside paler. Underside forewing creamy ochreous, thickly overlaid with blackish brown, costal dots and dashes repeated; cilia not speckled, outer half whitish.

Twenty-one specimens, Denver and Clear Creek, Colorado, July 17 to August 28, collected by E. J. Osler, four specimens from Dr. Barnes and two from Mr. Busck's collection.

Cotypes, Cat. No. 11,936 U.S.N.M., in Dr. Barnes and my collection.

This species is close to *graciliana* Krft. and *albiguttana* Zell., the former is similarly dotted on forewings but each dark dot is on a larger white dot; the latter is a very much smaller insect with the dots less in number but proportionately larger in size.

***Eucosma grotiana*, new species.**

Expanse 15–22 mm.

Palpi and head very dark cream or very pale fawn, former shaded with brown externally; it is flattened, upcurved with long scales on underside forming a round tuft extending $1\frac{1}{2}$ times eye-width beyond head, apical joint concealed; antenna dentate, light ochreous, a small dark brown dot on basal joint internally; thorax white with two transverse dark brown bars across patagia, near anterior and posterior ends similar bars across thorax at middle and before posterior end; abdomen and legs dark cream, latter dusted with brown.

Forewing. — White, with brown markings; the basal area is white with a curved line of brown scales from dorsum to costa, beyond is a narrow white area succeeded by a broken brown fascia at inner fourth which outlines the usual basal area, this is sharply angulated outward at middle of wing, and is obsolete on costal third. A prominent brown fascia, starts from middle of wing, curves outward with edges irregular to dorsum before tornus where it is widest. Before the apex is an irregular brown cloud, the upper larger part ovate, with an outer limb running into termen below middle and an inner limb as several black dots passing through center of ocellus; there is a faint line from its upper inner edge connecting with a costal spot at outer third. Above the cloud is a small patch of leaden scales. The costa is marked by a brown apical spot and two others above the cloud, the middle one the largest, each contains fine darker brown lines, and the white interspaces are divided by short brown lines. The male costal fold is smoky brown, with two dark brown spots and a paler one at outer end, between this and main costal spots are similar short brown lines or dashes on costa. There are several dark dots on middle of dorsal margin. The brown fascia and spots are usually outlined with blackish brown on their edges. Cilia, internally, gray speckled with brown, outer ends white.

Hindwing. — Light smoky brown, cilia whitish, with a broadly darker basal shade; underside the same. Underside forewing brassy brown, with light and dark costal and apical marks repeated.

Fifteen specimens, Chicago, July; Ames, Iowa, and Iowa, latter specimens labelled, "Ac. Cat. 118–121–267 C. P. Gillette"; Colorado

Nos. 628 and 2,610 ; Denver, Colo., June 22, Clear Creek, Colo., July 16-23 ; Bear Creek, Morrison, Colo., August 23, Oslar ; Pecos, New Mexico, August 25, at light, Cockerell.

Cotypes, Cat. No. 11,934 U.S.N.M. and my collection.

I have long had this species in my collection under *E. matutina* Grote and have doubtless so named it for correspondents ; but a careful reading of Grote's most imperfect description, in which even the expanse is omitted, and examination of his figure, as well as examination of a specimen determined by Dr. Fernald, who was acquainted with Grote's type, before his collection was sold to the British Museum, convinces me that this large, showy species is distinct. The brown of the marking of *matutina* is much paler and more of a fawn shade, but the easiest marks of separation are the brown spots on antennæ bases of *grotiana* which are entirely wanting in *matutina* ; in *matutina* on the white space between apex and fascia is a darker lance-like shade that connects with the latter, but this latter may occur on very dark specimens of *grotiana*, hence is hardly a good character. My conception of the expanse of *matutina* is 12-16 mm., much smaller in average size than *grotiana*.

***Eucosma costastrigulana*, new species.**

Expanse ♂ and ♀, 17-18 mm.

Head light ochreous brown ; palpi whitish ochreous, rather loosely scaled above and below on second joint, tuft flattened, triangular ; apical joint darker, very short, obtuse, almost hidden ; antenna ♂ very finely ciliate, gray ; thorax light ochreous brown, patagia and posterior end mottled with white ; abdomen bleached straw or same shade as palpi and hindwings ; legs pale ochreous, anterior pair shaded in front with blackish brown, and all tarsi ringed with same color.

Forewing. — Light ochreous brown or yellowish ochreous, shaded with darker brown on costal edge ; this brown edging is interrupted from base to apex by white dashes or strigulations, these also cover the ♂ costal fold ; there are four pairs before the middle and four pairs beyond the middle, the latter are more sharply defined than the former, the outer dash of each pair is usually longer than the inner, the first pair beyond middle sends a scattered line of white scales to inner bar of ocellus and a few leaden scales continue from the second and the apical pair. In the apex is a rounded white spot, its outer half resting on the cilia, it contains a few dark brown dots ; a similar whitish ciliate spot is just above tornus opposite ocellus. Before the ocellus the wing is more or less speckled with white. Ocellus is well-defined, with two or three rather long horizontal black lines, vertical bars are shining whitish with a small dot of same color below, in tornus ; before the inner bar are a few scattered black scales. Cilia, inner half whitish gray, finely atomized with black, and interrupted above tornus and in apex as stated, outer half shining pale ochreous. Underside grayish fuscous, with costal spots repeated.

Venation typical of *Eucosma*.

Described from four specimens, San Diego, Cal., July 8 and 10, collected by G. H. Field and bearing sub-labels "Tallys" and "Julian." I have also before me three other specimens labelled San Diego, Cal., July 27, W. S. Wright, that are very much whiter than the above, which I have no doubt are the same species, but bleached and rubbed from their longer exposure.

Cotypes, Cat. U.S.N.M. No. 11,932, and my collection.

***Eucosma sandiego*, new species.**

Expanse ♂ 25-27 mm., ♀ 27-28 mm.

Head light ochreous brown; palpi short, projecting scarcely half eye-width beyond head, brush compressed, concealing third joint, externally ochreous brown, internally whitish; antenna flattened laterally in male, serrate and finely ciliate, whitish brown; thorax brown, posterior end white; abdomen whitish fawn, the two anterior joints above white; legs whitish fawn, shaded with brown.

Forewing. — Rich chocolate-brown, marked with silvery white spots, which occur as follows: An irregular median streak from base to inner fourth, principally above fold, but sending a short spur, at its outer end along fold; beyond, before middle, is a quadrate spot in middle of wing; beyond this are two spots, one smaller, ovate in shape, is between tornus and lower angle of cell, the upper one elongate, resting beneath costa between middle and outer fourth; above its outer attenuated end is a small dot on costa; just before apex is an inwardly curved streak, sometimes divided by a line of ground color so that a dot forms at its inner end; just below apex is a smaller similar streak, below which three or four dots margin the termen to tornus, all of the spots are more or less distinctly outlined with darker scales. The dorsal edge is narrowly lined with silvery white from base to outer fifth. Cilia light brown, speckled with whitish.

Hindwing. — Pale fuscous, cilia whitish, with a slightly darker basal shade. Underside light ochreous gray; underside forewing ochreous brown, with the spots of upper surface indistinctly repeated in an ochreous shade.

Light form; marked as above but ground color is light ochreous brown or pale fawn; head, thorax and other parts of the same shade. The male costal fold is dark brown in the dark form and dark fawn in the light form, it is short extending only to inner fourth.

Four specimens, two males and two females, one pair of dark form and one pair light form. San Diego, Cal., September 15-29, George W. Field; Walters St., Cal., April, from J. B. Smith. Cotypes ♂ and ♀, Cat. No. 11,930 U.S.N.M. and in my collection.

This species is closer to *ridingsana* Rob. than any other of the silvery spotted *Eucosma's*; it can be separated by the median line, which in *ridingsana* is continuous from base to beyond middle of wing; the silvery costal streak, on inner half of wing (absent on male fold) of *ridingsana* is entirely absent in *sandiego*; the terminal line of dots of

sandiego is also a distinguishing mark. There is a certain amount of variation in the spots of *sandiego* as in *ridingsana*, in fact in both species, seldom are the two wings replicas of each other. The occurrence of both sexes of both the brown and ochreous form is interesting and if there were not such uniformity in the spots and markings I would be inclined to think there were two races.

***Cydia granulatana*, new species.**

Expanse 15-18 mm.

Head, palpi and forewing greenish-yellowish white, the color can better be understood by saying it is white with a greenish yellow tinge. Thorax same color but a trifle more yellowish, a few brown scales at base of patagia; antenna dark fuscous but this dark shade almost hidden by greenish white pubescence; abdomen shining, whitish fuscous; legs same shade as thorax, tarsi annulated with brown.

Forewing.—Ground color as stated, almost evenly throughout covered with vertical dashes of dark brown, giving a granulated appearance; under a lens these dashes are in four principal horizontal rows, the upper marks the costa evenly from base to apex, in the row below costa the dashes are smaller than in the dorsal row and the one above it, in some specimens in these two lower rows, especially the dorsal, there is a tendency of the dark color to run together on the inner two thirds below the fold. The ocellus is practically free from the dark dashes, containing only a few scattered blackish dots, it is bounded on both sides by shining whitish bars, and there are a few scattered shining scales from outer third of costa to inner bar, and similar shining scales on costa before apex, between the brown dashes. Cilia whitish, speckled, a brownish basal line.

Hindwing.—Gray, cilia whitish, with a darker basal band; underside the same and with a few darker scales in apex and along costa before apex. Underside forewing greenish gray, costa whitish on outer half with dashes repeated.

Thirteen specimens, Platte Cañon, Colorado, August 23; Denver, Colorado, September 4; Boulder, Colorado, all collected by E. J. Oslar; Colorado, No. 2,298, from U. S. N. M.

Cotypes, Cat. No. 11,935 U.S.N.M. and in my collection.

***Steganoptycha bolliana* Slingerland (Pl. II, Fig. 1).**

Steganoptycha bolliana Sling., Rural New-Yorker, p. 401, June 13, 1896.

This species is very closely allied to *diludana* Clem., in fact from the latter part of Clemens' description, Proc. Ent. Soc. Philada., III, 513, 1864, it is likely that he also had the species before him, as he writes: "In another specimen the markings of the forewings were of a more pronounced blackish brown, especially in the middle of the wing and the curved streak near the tip of the wing is somewhat obscured by a blackish brown patch that adjoins it." I am not aware of any breeding record of *diludana*. In the South, where the pecan

grows, *bolliana* lives upon its leaves, but I have undoubtedly the same species from western Pennsylvania, in addition I have certainly seen others from various parts of New Jersey and New York State ; as these Northern States' species cannot live on pecan, I have no doubt their larvæ will be found on one of the closely allied hickories.

Bolliana is much darker than *diludana*, the character by which it can be most easily separated is a black streak from middle of base to apex, which by an enlargement in basal third, another beyond middle and another before apex, represents three steps, or three large black spots connected by finer lines. The gray ground color has a greenish tinge, the dark marks have more of a mottled appearance than linear as is the case with *diludana*. The hindwings are dark, smoky brown, while in *diludana* they are light gray. The venation of both species is the same, it is shown by Fig. 1, Pl. III.

I have before me Professor Slingerland's original specimen, from which the cuts and remarks, establishing the specific name, were drawn, and by his courtesy am able to reproduce them below.

Through the courtesy of Professor Chittenden I have examined the following bred material in his possession : No. 2,848, on walnut, issued October, 1898, District of Columbia ; on pecan, issued October 22, 1907, Washington, D. C., H. O. Marsh ; No. 2,848, on pecan, issued August 12, 1898, Seabrook, So. Car. ; pecan, issued April 21, 1906, and June 2, 1905, Waco, Texas. Also the following flown material : Washington, D. C., resting on trunk of pecan, September 30, H. O. Marsh, collector ; (Chittenden) Oak Station, Allegheny Co., Pa., June 12-24, September 7, Fred Marlof ; Pittsburg, Pa., August 19 to September 29, Henry Engel ; New Brighton, Pa., September 5-17, F. A. Merrick.

The type of the species, so labelled, is in the Cornell University Collections, Ithaca, N. Y., and bearing serial label "C. U. Exp. No. 548, sub.— 18 April '96" ; compared specimens, homotypes, are in my collection.

I am indebted to Professor Chittenden for calling my attention to Professor Slingerland's article, which seems to have been entirely ignored by our catalogue makers.

A NEW DESTRUCTIVE INSECT ON PECANS (Rural New-Yorker, June 13, 1896, p. 401). C. E. P., Ocean Springs, Miss. — "I send some worms found on my pecan trees. The dark brown one spins a cocoon, works into the young buds as soon as the outer covering is

thrown off, and destroys the bud. Does it not belong to the Elater family? It seems to have two broods, one now, and the other in July. Or do they change from the small cocoon around the buds to the partly grown leaves, and form another cocoon? Or does the latter belong to a later brood? In the fall, the undersides of the leaves of some trees are fairly covered with their houses, but then I can kill them by spraying, as they feed on the leaves. What I want, is to get at them in the spring. Can it be done? The second white worm, with a dark head, works into the new growing shoots, and will destroy the fruit if it gets too plentiful. How can I get at it, as it is working inside the young shoots going down? Can you give me the history of both, as they develop into a serious pest?"

ANSWER BY M. V. SLINGERLAND: "The material sent by C. E. P. consisted of several opening pecan buds webbed together; two kinds of small caterpillars, one light green in color with black head and neck, the other dark brown, with similar black head and neck; and several pupæ inclosed in cocoons made by webbing the leaves together, as shown at *a* in Fig. 133. Judging from the appearance of the buds sent, the insects were doing very serious injury. The material was placed in some of my breeding cages at the insectary, and in a few days, there emerged from the pupæ some pretty little gray moths with blackish markings; two of them are shown natural size at *b* in Fig. 133. As we had nothing like them in our university collection here, one was sent to an expert for its name. His reply was that he had labeled the same insect in his collection, *Steganoptycha bollina*. His specimen came to him from Texas several years ago, but the name has never before been published; so C. E. P.'s pecan bud worm proves to be new to science. The moth is, probably, the parent of the green worm.

"I failed to breed the brown caterpillar which seems to work very similarly to the bud moth of our New York apple orchards. The early appearance of the moths, April 18, would indicate a second brood of the worms during the summer. Neither of the worms which I found in the material sent, has anything to do with the elaters or snapping-beetles; all were the caterpillars of small moths.

"Information about this new insect is so scanty that no definite advice can now be given as to the best time and manner to fight it. C. E. P. thinks that he can control it later in the season, and if this be true, it ought very materially to lessen the numbers to appear on the

buds in the spring. It is an extremely difficult matter to poison worms working on the opening buds of trees, for, as the leaves unfold so rapidly, new unpoisoned pastures are being constantly opened for them. I think, however, that two very thorough applications of Paris-green water, as strong as the trees will stand, while the buds are opening, would materially check these pecan bud worms."



Steganoptycha bolliana. (From Rural New Yorker.)

***Epinotia piceafoliana*, new species.**

Expanse 9.5 to 10.5 mm.

Head light gray, tinged with yellowish on top; palpi short, scarcely extending beyond head, tuft small, flattened, the scales at outer end not concealing the short, obtuse outer joint, color gray, shaded with blackish on outside, apical joint dusky black; antenna gray; thorax light cinereous gray, with a bronzy median shade; abdomen bronzy black, anal tuft gray-ochreous; legs gray, heavily dusted in front and tarsi ringed with bronzy black.

Forewing. — Costa nearly straight, slightly curving at base and apex, termen straight and only slightly oblique. Twelve veins, all free, accessory cell large, beginning midway between 10 and 11, outer end opposite 7; internal vein ending opposite 5. Color grayish white, crossed with blackish brown lines and narrow fasciæ. The basal area is defined by a heavier dark dentate line, from inner fourth of costa, curving outwardly to inner third of dorsum; before this are three or four parallel fine dark lines

on a gray-white ground, each starting with a blackish costal dot. From middle of costa to before tornus is a narrow dark fascia, interrupted by a white oblique line on middle of cell, below which an obtuse spur of the dark color on the outer edge of fascia. Between this fascia and basal area is a broad fascia of ground color traversed by broken dark lines, and on costa forming two white spots, each usually divided by a blackish dot. Beyond the dark fascia, the apical third is whitish gray, crossed by parallel dark line, starting as black costal dots and separated by four white costal spots. The apex is black and defined below by a white dash through the black terminal line and extending to outer edge of cilia. Ocellus not defined. Cilia dark leaden-gray.

Hindwing. — Smoky black, cilia dark gray, with a darker basal line. Eight veins, 3 and 4 stalked. Underside both wings dark smoky gray, costal spots repeated on forewing, and the latter grayish white below fold.

Twenty-eight specimens, Montclair, N. J., June 1 to 5, some bred from larvæ feeding on the needles of black spruce, *Picea mariana*; others taken resting on the twigs or flying about the same trees; Cincinnati, Ohio, May, 15, Miss Braun.

The mature larvæ are about 6 mm. long, robust, yellowish green. Head, p. t. shield and thoracic feet black. They mine the needles in the same manner as the larvæ of *Recurvaria picealla* K. When full grown they spin a dense white cocoon between the needles, close to the twig. I have taken the larvæ the first warm days of spring in April and early May, and they have pupated as early as April 28 and as late as May 18. Breeding number K. 510. In size and coloration this species is very much like *Eudemis vacciniana* Pack.¹

***Enarmonia articulata*na, new species.**

Expanse 13.5 mm.

Head and thorax bronzy black, minutely dotted with fuscous; palpi whitish inside, shaded with fuscous outside; posterior ends of patagia white; abdomen fuscous, banded with white beneath; legs whitish, front tibiæ annulated with black.

Forewing. — Velvety blackish brown. The inner fourth is overlaid with shining olivaceous gray, beyond this the lower two thirds and apical fourth are finely and evenly dotted with pale olivaceous-ochreous. On the middle of dorsal margin is a brilliant white spot, slightly wider than high; its upper edge connects with an oblique narrow fascia from inner third of costa, which is shining in the middle of wing, and whitish on costa where it is also germinate. A narrowly, very slightly germinate

¹ Since the above was written, I have received a series of the European species *Steganoptycha nanana* Tr. and careful comparison suggests that the two are identical. Meyrick in Hand Book of British Lepidoptera, p. 474, states that the larvæ of *nanana* are brown, with black head and plate, feeding on *Pinus abies*. It is not impossible that future observation may prove the identity of the European and American forms, especially as the species could be easily introduced, attached, in one of its stages to imported trees.

line starts from costa between middle and outer third, which runs to inner vertical ocellic bar. A short oblique streak is beyond and close to this, on costa and close to apex are two short white streaks, the inner one the longer and outwardly curved. The ocellic space is finely atomized with olivaceous cut by several horizontal black dots and lines, a line below, above it a dot, then another line (at about the middle of wing) above which are three superimposed dots, slightly inwardly oblique, to upper fourth of wing, between two white costal dashes; the ocellic spot is bounded on either side by a vertical shining metallic bar. The only spaces on the wing of the velvety brown-black ground color, free from the olivaceous atoms, are on upper two fifths, in the middle of wing, between the two prominent costal streaks, on the inner edge of the inner costal streak and on both sides of the white dorsal spot. Cilia shining fuscous, preceded by a fine black line.

Hindwing.—Whitish at base shading with dark brown outwardly, cilia whitish; underside the same. Underside forewing plumbeous brown, costal spots lightly repeated.

Two specimens, Cincinnati, Ohio, April 30, Miss Braun; New Brighton, Pa., H. D. Merrick, June 5. Cotype in Merrick Museum, and my collection.

***Enarmonia multilineana*, new species.**

Expanse 13–14 mm.

Head hoary black, mixed with white scales in front; palpi white, outside of median joint and apical joint shaded with light fuscous; antenna white, annulated with grayish fuscous; thorax mottled gray; patagia whitish posteriorly; abdomen cinereous gray; ♂ claspers whitish outside, yellowish inside and narrowly edged with fuscous posteriorly; legs whitish, annulated with dark fuscous.

Forewing.—Dark grayish fuscous, with many whitish, outwardly oblique, lines from costal and dorsal edges. A pair of these lines, from costa before middle, in the middle of wing, meet a pair from inner half of dorsal margin; the apex of this junction is half way between base and outer margin; before these lines the basal space is nearly uniformly of the mottled ground color, but indistinctly dotted with whitish on both costal and dorsal edges. Succeeding these lines is a darker fascia of about their width on upper half of wing but increasing to double the width on dorsum. Beyond this is a broken pair of whitish lines, from costa into ocellic spot. Between the latter and apex are three pairs of white costal dashes, the interspace of each pair is a darker, black shade, sending line of this color into termen. From the inner, of the middle pair of costal dashes, a faintly blue metallic line runs to the termen below apex, where it ends in a white patch in the cilia. A similar white cut occurs in the cilia above the tornus and another one below it; these last two are connected together by a white streak within the narrow black preciliate line. Ocellus gray, with three short horizontal black bars, bounded on either side by vertical bars of faintly blue metallic scales. Cilia, except as noted, shining leaden fuscous.

Hindwing.—White internally, edged with dark fuscous, narrowly at base and broadly at apex; cilia whitish. Underside the same. Underside forewing dark gray, with whitish costal and ciliate lines repeated.

Four specimens, Aweme, Manitoba, May 16, June 26 and 29,

Norman Criddle; Miniota, Minn., Merrick Museum. Cotype in Merrick Museum, and my collection.

This species is close to *garacana* Krft. but can be easily separated by the white hind wings.

***Tortrix triangulana*, new species.**

Expanse 14.5–15.5 mm.

Head whitish gray speckled with light fuscous; palpi externally same as head, internally whitish, apical joint fuscous at base, tipped with whitish; antenna, male ciliated, about 1, light gray annulated with darker fuscous; thorax speckled blackish brown, posterior end and patagia tipped with cream-white; abdomen light gray, anal joint ochreous gray; legs cream-white dusted with brown.

Forewing. — Grayish white with a yellowish tinge, strigulated and marked with blackish brown. The most prominent mark on the wing is a large blackish triangle, with nearly even sides, resting on costa beyond middle, its lower point extends to middle of wing. There is an obscure basal area on inner fourth, blackish along costa and dorsal margins and with two wavy dark transverse lines. On costa between triangular spot and apex are two quadrate spots, the outer one the larger; the apex is gray enclosed with a fine dark line. The balance of wing is gray with vertical darker lines, one between basal area and triangular spot, a waving line connecting lower point of triangle with dorsal edge and two or three irregular lines beyond. In the inner half of wing, especially on and adjoining the fold, the dark lines are outlined with ochreous scales. Cilia concolorous.

Hindwing. — Smoky fuscous, cilia same with a paler basal line; underside whitish gray vertically strigulated with brown. Underside forewing dark smoky fuscous, with whitish geninate costal spots.

Described from three males, one from San Francisco, two from San Diego, California, July 27–31, collected by W. S. Wright, and received through U. S. National Museum.

Cotypes, Cat. No. 11,933 U.S.N.M. and in my collection.

Of the San Diego specimens one is very badly rubbed, the other, in fair condition, is much whiter and the markings blacker than the San Francisco specimen. It is nearest to the very strongly and somewhat similarly marked *T. lomonana* Krft.

***Phalonia punctadiscana*, new species.**

Expanse 12–13 mm.

Head cinereous gray, speckled with fuscous; palpi light gray within, shaded with fuscous externally, apical joint short, blunt, black, tipped with gray; antenna dark fuscous; thorax cinereous gray, broadly mottled with brown-fuscous; abdomen dark gray, tuft cinereous; legs yellowish white, anterior pair shaded with dark brown.

Forewing. — Light olivaceous gray on inner half of wing, heavily speckled with darker gray, especially along basal third of costa; the basal area is not defined, but that part of wing is clouded with darker scales. There is a well defined reniform spot of light brown in middle of wing, the upper end resting on costa, it reaches to

fold, its inner edge is sharply incised above middle, the outer edge is convex, with an obscure spur pointing toward costa from its middle. There is a similar brown shade between end of cell and termen, with a narrow projection touching costa at outer fifth, below costa it is much enlarged and rounded with two obscure spurs touching termen about the middle; both of these brown shades are horizontally streaked with darker brown on the middle of wing, and edged with black on the inner one, forming a conspicuous dark discal streak, the space between them, or upper half of wing is silvery gray, overlaid with pink; costal edge of outer half narrowly yellow, with two fuscous dots between the brown shades and two larger ones between the outer shade and apex. Cilia concolorous, with a darker basal line and a paler spot at end of each vein along the termen.

Hindwing. — Cinereous gray lighter basally, underside light cinereous, with vertical fuscous reticulations on outer half. Underside forewing, smoky fuscous, with a fine light line before cilia and the latter spotted with whitish.

Five specimens, Oak Station, Pittsburg, Pa. (Fred. Marloff), July 29 to August 8. Nearest *P. nonlavana* Krft. most easily distinguished by the dark, horizontal discal streak.

***Commophila? umbrabasana*, new species (Pl. III, Fig. 2).**

Male. — Expanse 14–17 mm., female 20 mm.

Head pale ochreous; palpi darker and shaded externally with brown, extends beyond head nearly twice width of eye, second joint tufted above, flatly triangular, scales rather compressed; apical joint very short, obtuse, light brown, paler at tip and with a few darker scales at its base; antenna, basal joint enlarged with compressed scales, brown on basal half, pale ochreous outer half, beyond basal joint it is ciliated on lower side, ciliations 1, color whitish brown; thorax brown, same shade as basal sixth of forewing; abdomen light grayish ochreous; legs same color, heavily dusted with blackish brown, posterior tibiae tufted below.

Forewing. — Very pale fawn, or light ochreous brown, vertically strigulated with dark brown, these dark scales tend to form a more or less well-defined triangular dorsal spot, beyond middle, sharply defined above by outer end of fold; in some specimens the inner and outer edges of the spot are heavily overlaid with leaden metallic. The basal sixth is brown, with a bluish iridescent hue in certain lights. The costa is lightly marked by the darker strigulation, four spots on outer third are the most distinct. Above the dorsal triangular spot is a conspicuous brown dot, on the lower angle of cell, this is absent on specimens that are slightly rubbed. In some specimens the apical third is heavily strigulated with grayish fuscous, this shade margining both costal and dorsal edges to before middle. Cilia light ochreous yellow.

Hindwing. — Above and beneath light grayish ochreous. Underside forewing shining, light coppery brown.

Described from ten specimens, three from San Diego, Cal., May 6, collected by W. S. Wright; one Colfax, Placer Co., Cal., December, collected by A. H. Vachell; six, Alameda Co., Cal., June 17, collected by G. R. Pilate, for Miss Braun.

Cotypes, Cat. U.S.N.M. No. 11,931, Miss Braun's and in my collection.

This species is placed temporarily under *commophila* as this genus is understood in our North American lists, the venation is practically the same, but there are characters which will later cause its removal to probably a new genus.

Forewing. — Two and one half times as long as broad, costal and dorsal margins nearly parallel; costa strongly arched at base and curved downward at apex; apex rounded, obtuse; termen very slightly convex, angle 30° ; tornus rounding into dorsum without defined angle. Venation; 1^b furcate two fifths; 2 from outer eighth of cell; 3 and 4 approximate, the latter strongly bent down; 5, 6 and 7 about equally spaced, latter to costa before apex; 8 very close to but not connate with 7; 9 from outer angle of cell; 11 half way between 10 and 12. Cell is very broad at outer end, equal to one third width of wing, transverse vein angles outwardly from 9 to 7 then inwardly (paralleling termen) to 4. No secondary cell.

Hindwing. — Slightly broader than forewing, costa gently arched, apex obtuse, termen slightly indented above 5, tornus, dorsum and inner angle evenly rounded. Venation; 1^b furcate $\frac{1}{3}$, two from outer third, 3 and 4 connate from lower angle of cell, 5 remote from 3 + 4, 6 and 7 connate from upper angle. Cell very short, about two fifths, transverse vein strong, obliquely inward from upper angle to middle of cell, thence outward to lower angle. A pencil of long hairs reposes on the costa, arising from a process, at base of costa, this is overlaid with spatulate scales. Vein 1^a is heavily pectinated, at base of wing, on upper surface.

Choreutis tacubayella, new species.

Expanse 10 mm.

Thorax olive-brown, very finely speckled with white, with a white spot on posterior end; abdomen dark fuscous. Each joint whitish posteriorly, anal tuft blackish; legs, underside of thorax and underside first two abdominal segments white, slightly dusted with fuscous. (Head missing.)

Forewing. — Olivaceous brown, with an ochreous tinge at base, outer half overlaid with whitish tipped scales, giving a speckled appearance. There is a conspicuous pure white fascia, arising from dorsum between inner fifth and third, it reaches to upper vein of cell; it is broadest on dorsum, inclines slightly outward and diminishes in width to upper end; the upper part is faintly dotted with pale fuscous. The principal metallic marks are brilliant ruby red and occur as follows: a broken transverse line just beyond the white fascia; two clusters in outer fourth of wing below middle on a large velvety black ovate spot, which is divided vertically by an olivaceous line; above this below costa is a smaller spot and a similar one before and below it, these are both circled with black; bordering termen is a fine line on upper half of wing; in middle of wing, before end of cell is a small ovate blackish spot, in which are scattered metallic scales. The costa is marked by three white dots, one before the middle, one just beyond middle and one at outer fourth; the inner one is at the end of the inner metallic line, below the middle one are a few such scales, while the outer one is above the outer metallic spot. The veins before apex are overlaid with black, there is a median black dash at base and another in middle of wing. The termen is narrowly edged with olivaceous ochreous. In certain lights a few scattered metallic scales can be seen, especially on base of costa, in middle of wing at base, above

dorsum at outer fourth, and evanescently the edges of the ruby red spots are so colored. Cilia olivaceous brown, finely tipped with white.

Hindwing. — Bronzy brown, cilia whitish. Underside both wings brassy brown, the lower wing blotched with white, and the costal spots repeated on the upper.

One ♂, Tacubaya, Mexico, collected by Otis W. Barrett. Type in my collection.

***Argyresthia alternatella*, new species.**

Expanse 10–12 mm.

Head white; palpi golden; antenna golden fuscous, basal joint paler; thorax white, patagia and posterior end golden; abdomen and legs whitish ochreous.

Forewing. — Golden ochreous, reticulated with brown oblique fasciæ, there are five brown spots on costa, about equally spaced between inner sixth and outer fifth, there are three similar spots on dorsal margin, at inner fourth, middle and outer fourth; broken brown fascia join the costal and dorsal spots, somewhat like a double or joined letter **WV**. There is a streak of brown on dorsum at base, and the apex of wing is lightly reticulated with this color. Cilia light brownish ochreous on costa and upper half of termen becoming pale fuscous below middle.

Hindwing. — Light fuscous, cilia with a faint ochreous tinge.

Eight specimens, Essex Co., Caldwell and Watchung Mts., N. J., May 8–21.

Type in my collection.

Mr. Busck, to whom these specimens were shown, thought they might be *A. cupressella* Wlsm. (described from California) which they superficially resemble, but the two species can easily be separated by the venation. *Cupressella* has 11 veins in forewing and 7 in hindwing, while *alternatella* has 12 and 8 respectively with 7–8 of former stalked; the latter species is quite a little larger.

***Argyresthia loricella*, new species (Pl. III, Fig. 5).**

Expanse 10–12 mm.

Head and palpi whitish ochreous, latter shaded with light fuscous externally on median joint, face and antennæ white; thorax shining whitish ochreous; abdomen paler, legs whitish, anterior pair and tarsi of all dusted with brown.

Forewing. — Neary immaculate, very pale shining ochreous, the inner half of costal edge and narrowly in the fold is more or less of a darker shade. Cilia whitish ochreous.

Hindwing. — Same color as cilia of forewing.

Six specimens bred from larvæ living in the terminal twigs of *Larix americana*, at Mer Bleue, Ontario, Canada. In pupa June 19 (when found), issued July 3–6.

Cotypes, Catalogue No. 12,059 U.S.N.M., Dr. Fletcher's and my collection.

The discovery of this species is due to Dr. Jas. Fletcher, with whom I was on a collecting trip to a wonderful sphagnum swamp, about twenty miles south of the Ottawa River, at Carsbad Station, Ontario. He tells me that he had noticed for some years that insects were killing the twigs of the larch and had occurred in sufficient numbers to be of possible economic importance. The larvæ bore through the terminal twigs, for from three to six inches, effectually killing them and stopping further growth. Mr. Busck is responsible for the generic determination.

***Chrysopora versicolorella*, new species** (Pl. III, Fig. 3).

Expanse 9-10 mm.

Head and antenna bronzy black, latter with whitish pubescence; median joint palpi bronzy black, apical joint ochreous gray; thorax iridescent gray; abdomen grayish fuscous, anal tuft and legs ochreous white, latter banded with dark brown.

Forewing. — The white ground color occurs as follows: on the lower three fifths of wing from base nearly to middle; a large triangular spot on middle of costa which sends an attenuated fascia to dorsum, this is largely iridescent; a pure white spot on costa before apex, a smaller one below it on middle of termen and another below this above tornus; in some specimens these spots are so nearly connected together that they form a very angulated terminal fascia. Above the white inner patch is a blackish patch interrupted with pale blue metallic scales, a broad ovate spot of this color divides it beyond its middle, touching the costa and continuing as an iridescent fascia over the white area to dorsum. Between the middle and terminal whitish spots or fasciæ is an irregular patch of olivaceous ochreous, more or less overlaid with metallic pale blue or pink on the lower and outer spurs. There is an oblique blackish brown streak involving the apex and apical cilia, the inner end of this indents the outer white costal spot and the one below it. Cilia fuscous, paler outwardly, broken by white opposite the tornal white spot.

Hindwing. — Pale shining gray, cilia and underside the same. Underside forewing dark iridescent gray.

Six specimens, Carmel, California, April, collected by Arthur H. Vachell.

Type in my collection.

The three species accredited to North America can be separated as follows:

Dorsal margin on inner half of forewing white.....	<i>versicolorella</i> K.
Dorsal margin on inner half of forewing not white.....	1
1. Forewing with transverse silvery fascia before middle.....	<i>hermannella</i> F.*
1. Forewing with fascia interrupted in middle.....	<i>lingulacella</i> Cl.

* I am not convinced that this European species actually occurs in the North American fauna.

As will be noted from Pl. III, Fig. 3, the venation of this species is not identical with that of *C. lingulacella* Clem. as shown on Pl. XXIX, Fig. 9, Proc. U. S. N. M., Vol. XXV, by Busck, veins 3-4 of forewing are distinctly connate in *versicolorella* while in *lingulacella* they are well separated, as shown by Fig. 4.

***Gelechia invariabilis*, new species.**

Expanse 18-22 mm.

Head whitish in front, above suffused with light brown; palpi, second joint white mottled with dark gray, terminal joint black speckled with white; antenna light brownish cream color, basal joint darker; thorax light ochreous brown, shoulders of patagia, shade across middle and posterior end reddish brown — the shade known as terracotta red. Abdomen light ochreous; legs white, shaded with fuscous.

Forewing. — Costal half whitish ochreous, dorsal half reddish terracotta; the division line is dentate and very sharply defined, the red touches costa at base, thence obliquely to fold at inner third, it then bulges out above the fold reaching middle of cell before middle of wing, the upper edge of prominence is rounded from where it curves concavely to middle of wing at end of cell, thence obliquely to tornus. Separated from the dorsal red shade by a narrow line of light ochreous ground color, the red is continued along termen. In apex is a large reddish brown spot, and two others of same size on costa, between veins 8 and 10. The inner two thirds of costa is narrowly edged with black and on the termen is a line of same color broken with white over each vein. The dorsal margin is narrowly edged with black adjoining the red area, and the latter is somewhat dotted and streaked with black; the upper edge of red area is strongly marked with black, except at extreme base. Cilia grayish white, dotted with fuscous.

Hindwing. — Light gray, cilia tinged with cinereous, underside the same. Underside forewing ochreous brown, costal spots repeated, tinged with purplish on dorsal half.

Nine specimens, Stockton, Utah, September 5-9, 1906, collected by Tom Spalding.

Type in my collection.

In venation and structure this species is like *variabilis* Busck, there is also a superficial resemblance, but regardless of the characteristic red dorsal edging of *invariabilis*, the position of the black median streaks is very different, in the latter they are deeply indentate while in the former they are straight lines.

***Gelechia terminimaculella*, new species.**

Expanse 17-18.5 mm.

Scales of head white, tipped with shining fuscous; second joint of palpi grayish white, lightly speckled with blackish brown, and a shade of the latter color at base beneath, apical joint dark brown, dusted with white in the middle and at the tip; antenna fuscous and white annulations; thorax stone gray; abdomen yellowish gray; legs gray, the anterior tarsi dark brown, annulated with whitish gray at the joints.

Forewing. — Stone gray, marked with black. The base of costa is blackish gray, from the inner fifth a short black dash joins an oblique inverted comma-shaped mark that extends to fold. Between this and base there is a small black dash in the middle of wing and a dot on dorsal margin close to base. In the middle of cell are two black dots, the upper one nearer the base; above them the costa is slightly sprinkled with black scales. At the outer third of costa there is a rounded shade of blackish scales, extending down to middle of wing; on the inner edge of this shade, at end of cell, is an oblique, elongated black spot. The terminal line is a row of dots, beginning with the costal cilia and following the termen to tornus, one dot between each two veins; before these dots the venal interspaces are very slightly dusted with black. Cilia concolorous.

Hindwing. — Very light gray, cilia with a faint yellowish tinge; underside the same, with a clouding of fuscous along costa and in apex. Underside forewing dark fuscous, with the terminal dots faintly repeated.

Six specimens, Aweme, Manitoba, June 13-16, Norman Criddle; Rounthwaite, Manitoba, June 15, L. E. Marmont.

Type in my collection.

The shape of wings and venation is exactly like figure of *Gelechia serotinella* Busck, Proc. U. S. N. M., XXV, 1902, the palpi structure agrees with *G. alternatella*. The markings of the species are close to *fondella* Busck; it can easily be separated by its larger size, the separated dots on disc and by the prominent terminal line of black dots.

***Gelechia alternatella*, new species.**

Expanse 14.5-15.5 mm.

Thorax and head mottled brown and bronzy black, darkest posteriorly, face brown mixed with white scales; labial palpi, second joint, white at base both inner and outer surfaces, lower edge mottled with dark brown, this mottling extends over the outer half both inside and out, apical joint very dark brown, sparsely dotted with white; antenna black, annulated with white; abdomen, anterior edge each segment dark bronzy brown, posterior edges broadly white, and segment brown; legs black, annulated with white at joints; tongue long, basal third scaled with whitish gray in front; ocelli present.

Forewing. — There are four dark brown transverse streaks or fasciæ, on a whitish gray ground color, all of nearly equal width dividing the surface into sharply defined alternate streaks of these colors. The brown is as follows: from the costa at base an oblique fascia goes below fold but does not reach dorsum; the base before and below it is whitish gray; before the middle is a transverse fascia slightly broader on costa and denticulate in middle, on inner edge; there is a broad shade of brown on costa from middle to outer fourth, occupying the upper third of wing, from the middle of this a darker brown fascia curves obliquely to tornus; there is a broad subterminal fascia from apex to tornus; terminal line, beyond this is whitish gray. The subterminal fascia makes a small brown spot in the costal cilia before apex, and in the whitish space before it is another brown ciliary spot on costa. Cilia gray at apex, shading into whitish below, with three small clusters of darker scales on upper half of termen. The gray-white ground color is somewhat mottled with brown scales.

Hindwing. — Light brassy fuscous, cilia gray, underside whitish gray; underside forewing bronzy brown somewhat overlaid with white.

Five specimens, Aweme, Manitoba, May 12 to 25, collected by Norman Criddle; ten specimens from A. J. Oslar, Chimney Gulch, Golden, Colo., April 14.

Type in my collection.

The venation, shape of wings and structure of palpi agree with figure of *Gelechia terrella* Hbn. in Meyrick's Hand Book British Lepidoptera, except that vein 5 of hindwing rises about one third from lower angle of cell and veins 6 and 7 are separate. Mr. Busck regards this species as *G. virgella* Thnbg. (*longicornis* Curt.). I have carefully compared a series of this European species and do not agree with his opinion.

***Coleophora elæagnisella*, new species** (Pl. III, Figs. 7 and 8).

Expanse 15 to 21 mm.

Head, thorax and palpi dull white (or white with the least trace of a grayish shade), palpi shaded with gray externally; antennal brushes white in front, gray behind, twice as long as basal joints; antenna white with broad cinereous annulations; abdomen cinereous; legs dull white, anterior pair dusted with gray in front, all faintly darker between joints.

Forewing. — Dull white, slightly shining, dotted sparsely to heavily with dark brown in horizontal rows, except at extreme base; the dark dots are more closely spaced in apical third of wing. Nowhere do they congregate into larger spots or lines. The white color extends out to the end of the cilia at extreme apex, and is heavily dotted with dark brown; below apex cilia is grayish cinereous.

Hindwing. — Shining grayish fuscous, cilia cinereous. Underside both wings the same.

Winter case about 3 mm. long, the ends and under surface are dark brown, on the upper surface is a large grayish patch: the case is scimeter-shaped, dorsal edge well rounded, radius about 100°, ventral edge with an enlargement in the middle, mouth at an angle of about 45° from the ventral line. It is securely attached by the mouth end only to the bark, sometimes in a fork.

Mature case, 10–12 mm. long, 2.25 mm. wide, 1.75 mm. thick; of the same general shape as the winter case but less rounded on the dorsal edge, and the hump on the ventral edge is depressed in the middle. The appearance of the mature case would indicate that it was not entirely new, but that the winter case had been used and enlarged by splitting along the ventral line and broadening it out with gray silk, then adding to the open end as the larva required more room. The old part is blackish brown, middle cinereous gray, outer end dark brown, the additions are added on the same angle as the mouth opening, giving an oblique direction to the ridges.

Fig. 7 shows maculation of forewing, Fig. 8 the large mature case and the small winter case, all three drawn to same scale.

Described from twelve specimens and many cases all taken in the Central Experiment Farms at Ottawa, Ontario, feeding on *Elæagnus argentea* and the closely allied *Hippophoe rhamnoides* and *Shepherdia argentea*. I am indebted to Dr. James Fletcher for the botanical names and to both him and Mr. Arthur Gibson for collecting the winter cases.

Type in my collection.

In the middle of June, 1907, the mature cases were found most abundantly, in fact so much so, that the shrubs of *Elæagnus* and allied plants very perceptibly showed the effect of the operations of the larvæ. The latter were not sufficiently full fed at this date and only one completed its transformations on July, 24. In 1908 Mr. Gibson sent me about twenty mature cases, which produced eleven specimens between July 4 and 25.

***Nepticula slingerlandella*, new species.**

Expanse 3.5 to 5 mm.

Head and frontal tuft orange, antenna eye-caps and side tufts white; antenna whitish gray; thorax bronzy black; abdomen light gray; legs yellowish white, posterior tarsi finely ringed with black.

Forewing. — Bronzy black with a shining white fascia at outer third. Cilia and hind wings light gray.

Type in my collection, numerous topotypes in Cornell University collection; all bred from blotch mines on leaves of plum in domestic orchards near Rochester, N. Y., by Prof. M. V. Slingerland, in whose honor the species is named. In a forthcoming bulletin Professor Slingerland will give a detailed account of the life history.

***Incurvaria ? dietziella*, new species** (Pl. III, Fig. 6).

Expanse 6.5 to 10.5 mm.

Antenna finely serrate, thick, about two thirds as long as forewing, purplish black. Labial palpi short, do not extend beyond face, clothed with long yellow hairs mixed with brown. Max. palpi, if present, probably short, folded, concealed by dense hairs on face. Tongue well developed, scaled above. Eyes round, prominent, wide apart. Ocelli present. Head and face covered with long, light ochreous yellow hairs. Abdomen bronzy black. Legs, anterior and middle pair bronzy black, posterior pair grayish brown, whitish at joints and the tibiæ much thickened with appressed scales, from the upper side of which are emitted a dense pencil or cluster of hair-like scales.

Forewing. — Ovate-lanceolate, obtusely pointed at apex; 12 veins, 2 from lower angle of cell, 7 and 8 stalked both to costa; 1^b furcate at base. Cell widened in outer third by absorption of accessory vein. Between 3 and 9 transverse vein is not tubular. Color bronzy black, finely dotted with metallic blue. The ground color by reflected light is golden and purple bronze; the thorax exhibits the same reflections. Cilia grayish below apex, above concolorous.

Hindwing. — Broadly lanceolate, costa arched at base nearly straight to outer fifth, apex obtusely rounded, termen oblique, straight; dorsal margin nearly parallel to costa. Eight veins, 5 and 6 short stalked, 7 from upper angle of cell; 1^b furcate at base; between 3 and 7 transverse vein is not tubular. Color bronzy brown, slightly shining, but without the brilliant gold reflections of the forewing; grayish white above cell; cilia shining grayish brown. Underside both wings shining golden gray.

Described from about fifty specimens all taken in Essex County Park, New Jersey, flying about or resting on the leaves and flowerets of dogwood, *Cornus candidissimus*, May 30 to June 15.

Cotypes, Cat. No. 12,058 U.S.N.M., in Dr. Dietz's and my collections.

Named in honor of Wm. G. Dietz, M.D., of Hazleton, Pa., who has recently revised the very difficult group to which this species belongs. Dr. Dietz writes me that he believes that this species represents a new and valid genus, but I prefer to leave this for future settlement, which will be aided by the diagnosis and figures. The specimens were all collected on two small clumps of *C. candidissimus*, flying in the bright sunshine, morning and afternoon; I visited these clumps nearly every week during the summer and made exhaustive efforts to find some clue to the life history, but without success.

This species is much like *P. acerifoliella* Fitch but besides the structural differences, the forewings of latter are brilliant metallic blue, the hindwings are grayer and the head tuft is a deeper, brighter orange.

EXPLANATION OF PLATE.

- FIG. 1. Venation *Steganoptycha bolliana* Sling.
- FIG. 2. Venation *Commophila umbrabasana* sp. nov.
- FIG. 3. Venation *Chrysopora versicolorella* sp. nov.
- FIG. 4. Venation *Chrysopora lingulacella* Clem.
- FIG. 5. Venation *Argyresthia laricella* sp. nov.
- FIG. 6. Venation *Incurvaria dietziella* sp. nov.
- FIG. 7. Venation forewing, *Coleophora eleagnisella* sp. nov.
- FIG. 8. Cases of *Coleophora eleagnisella* sp. nov.

WILLIS GRANT JOHNSON.

The untimely death of Professor Johnson at the age of forty-two years removes from our midst an able student of the broader problems of economic entomology. On March 11, 1908, at his home in New York City he succumbed to spinal meningitis. Mr. Johnson was born in 1866 at New Albany, Ohio, and received his earlier collegiate

training at Ohio State University. Later he took both his Bachelor and Master of Science degrees at Cornell University where he made a specialty of economic entomology. His professional career was a busy one in the work of teacher, investigator and editor. He was instructor for a time in Leland Stanford University and also in the University of Illinois, at the same time conducting important investigations. He served as State Entomologist of Maryland and later organized the State Horticultural Department, remaining at its head until 1900, when he resigned to take up the journalistic work along agricultural lines in which he has since become so well known. His first work in this direction was as managing editor of the *American Agriculturalist*, which was followed by the associate editorship of the *Agriculturalist*, the *New England Farmer* and the *Orange Judd Farmer*. His most recent honor was the appointment, a short time before his death, to the Board of Control of the New York Experiment Station at Geneva.

Though in recent years he was prevented by heavy editorial duties from carrying on much research, his interest in such work never flagged, and his unfailing enthusiasm was a stimulation to all with whom he came in contact. He was member of a number of societies and the author of numerous reports and bulletins.

JOURNAL

OF THE

New York Entomological Society.

EDITED BY WILLIAM MORTON WHEELER.

Publishes articles relating to any class of the subkingdom Arthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF JANUARY 7, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with seventeen members and one visitor present.

The minutes of December 17 were read and approved.

The treasurer, Mr. Davis, read his annual report as follows :

Society's account :

Balance January 1, 1907.....	\$772.28	Postage, printing, stationery and	
Dues	168.00	general expenses.....	\$ 49.44
Interest on deposits.....	26.02		916.86
	<u>\$966.30</u>		<u>\$966.30</u>

Journal's account :

Balance January 1, 1907.....	\$200.56	Cost of printing and mailing	
Subscription and sale of		Journal (4 nos.).....	\$491.74
separates	433.29	Balance	142.11
	<u>\$633.85</u>		<u>\$633.85</u>

Total assets, $\$966.30 + \$142.11 = \$1,058.97$, total balance. Mr. Davis also reported that of the 62 members 49 received the JOURNAL in 1907 and that the JOURNAL now had 128 subscribers. He also presented the names of several members who were in arrears for membership and JOURNAL dues.

On motion the report was accepted.

The librarian, Mr. Schaeffer, read his report as follows :

"The regular exchanges have been received, duly separated and exhibited at the meetings and published as required in the proceedings of the society. Forty (40) complete volumes of the JOURNAL, 26 single numbers and 5 author's extras, includ-

ing in the latter a copy of Neumoegen and Dyar's *Bombyces*, have been sent out during the past year. All of these are mostly sales; a few single numbers have been sent to subscribers who for some reason did not receive their regular copy. The remaining unbound volumes of the JOURNAL (Vols. VII-XIV) in the society's library will soon be bound as authorized by the society."

On motion the report was accepted.

Professor Wheeler, chairman of the executive committee, reported that at a recent meeting of the committee it was thought best to refer the matter of arranging for lectures in coöperation with the New York Academy of Sciences to a special committee of five who should be appointed by the President and to coöperate with a similar committee from the Brooklyn Entomological Society.

Also that the secretary be authorized and requested to forward to the Curator of Entomology, Mr. Beutenmüller, the thanks of the society for his courtesy in opening the cabinet of insects for the inspection of members on meeting nights of the society.

Also that the secretary be authorized to notify members who are in arrears that if their dues are not received in one month's time their names shall be dropped from the roll of the society.

Mr. Groth's motion was carried that the secretary give 30 days' notice by letter to delinquent members.

Later Professor Wheeler added to the report of the executive committee that the secretary be requested to insert a few lines in the next Bulletin of the Academy of Natural Science calling the attention of the members to the fact that the insect collection at the Museum would be open for inspection on each meeting night of the society.

Dr. Love, chairman of the publication committee, reported "that during the year of 1907 as no matter has arisen calling for action by the committee and as the membership of that committee is somewhat scattered no meetings were held. Under the able editorship of Dr. Harrison G. Dyar the JOURNAL of the society has completed its fifteenth volume, with 267 pages and 2 plates. The Editor reports that the volume contained 47 leading articles by 24 authors, with a complete index of generic and specific names. The headings indicating Class and Order treated of have been continued. Separates have been given to all authors. These were cut from extra sheets printed for that purpose, as in no case did an author request specially printed separates.

The total cost of the volume was \$411.94.

Dr. Love presented Dr. Dyar's resignation as editor of the JOURNAL. This was accepted on motion.

The following resolution offered by Dr. Love was unanimously adopted:

"The New York Entomological Society wishes to express to Dr. Harrison G. Dyar its high appreciation and warmest thanks for the very able services he has rendered the society in the conduct of its JOURNAL during the several years of his editorship."

Mr. Harris of the auditing committee reported that the committee had carefully examined the books and accounts of the treasurer for the year 1907 and found that all money received had been accounted for and that the balances reported are on deposit in the Harlem Savings Bank and New York Produce Exchange Bank; moreover that all disbursements have been authorized, are proper and reasonable and are vouched for by receipts filed with the accounts.

The committee wished to commend the watchfulness and economy of the treasurer, and congratulate the society upon possessing the services of so conscientious and faithful an officer.

On motion the report was accepted.

As Mr. Joutel, chairman of the nominating committee, was absent, Mr. Harris presented the nominations of the committee as follows :

President. — C. W. Leng.

Vice-President. — E. B. Southwick.

Treasurer. — W. T. Davis.

Recording and Corresponding Secretary. — H. G. Barber.

Librarian. — C. Schaeffer.

Executive Committee. — W. M. Wheeler, G. P. Engelhardt, C. F. Groth, F. E. Watson and G. Beyer.

Publication Committee. — E. G. Love, E. P. Felt, C. Schaeffer and W. M. Wheeler.

Delegate to Council of Academy of Sciences. — C. H. Roberts.

On motion of Dr. Love the by-laws were suspended and the secretary instructed to cast one ballot for the nominated officers.

The president appointed the following standing committee :

Auditing Committee ; E. D. Harris, E. L. Dickerson and E. B. Southwick.

Field Committee : W. T. Davis and Mr. Dow.

The president also appointed the lecture committee of five to coöperate with the Brooklyn Entomological Society as follows :

Prof. W. M. Wheeler, Prof. Raymond C. Osburn, E. L. Dickerson, E. D. Harris and Dr. E. G. Love.

The secretary presented the resignation as members of Dr. Harrison G. Dyar and Dr. Frank W. Holms.

On motion of Mr. Schaeffer their resignations were accepted with regret.

As this finished the completion of the business before the meeting the reading of scientific papers and discussion was taken up.

Mr. Geo. P. Engelhardt spoke of his collecting experience at Lakehurst, N. J., during the past season, illustrating the subject with photographs and various interesting species of insects. Lakehurst was visited in August, September and October, in the company of Mr. Davis and Professor Wheeler on the last occasion. General collecting both by daylight and at night was very satisfactory, little less than one thousand insects having been taken. Much time was spent in attempts to determine species of Cicadidæ, Gryllidæ and Locustidæ by their sound characters. Several species which show but slight structural differences could be easily distinguished by this means. A number of Cicadidæ including several species were obtained through the agency of the cicada-killer wasps (*Sphecius speciosus*). By watching the wasps flying among the pine boughs hunting for their prey the presence of the cicada could be detected. When captured by the wasp the cicada would receive a paralyzing sting and it would usually drop to the ground. In sugaring both plain molasses and the same with a few drops of fusel-oil added proved effective. The use of the fusel-oil mixture can be recommended as retaining its odor longer and remaining attractive even after three or four days without fresh application. Moths come to the bait in large numbers but rather few in species. A small acetylene lamp was used to good advantage at night.

Among the specimens exhibited, Mr. Engelhardt pointed out *Memythrus polistiformis*, a Sesiid moth known as the grape-root borer, as new to the New Jersey list of insects. Several of these moths were captured in an abandoned vineyard.

A report on the investigation of colonies of slave-making and fungus-raising ants by Professor Wheeler proved a source of much information and interest.

Mr. Barber exhibited a collection of Hemiptera collected by Prof. E. B. Wilson on his recent trip to the southwestern United States. Some remarks were made concerning some of the more unusual forms. Professor Wilson had added to the fauna of the United States *Milyas spinicollis* Champ. which hitherto has been known only from Mexico.

Society adjourned.

MEETING OF JANUARY 21, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with twenty-two members and four visitors present.

The minutes of the preceding meeting were read and approved.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges: Zeitschrift f. Wissenschaftliche Insekten-biologie. Vol. III, Nos. 7, 8 and 9.

The New Jersey Salt Marsh and its Improvement. N. J. Agri. Exp. Station Bull., No. 207.

Horæ Societatis Entomologicæ Rossicæ. Vol. XXXVIII, Nos. 1 and 2.

Verhandlungen d. K. K. Zool. Bot. Gesell., Wien. Vol. LVII, No. 9.

Museum of Brooklyn Inst. of Arts and Sciences Bull., Vol. I, No. II.

Trans. Texas Acad. for 1906.

Tijdschrift voor Entomologie, Vol. I, No. 4.

Dr. Love, of the publication committee, announced that Professor Wheeler had consented to assume the editorship of the JOURNAL.

Dr. Dow proposed as an active member Mr. Frederick M. Schott, 854 Bushwick Ave., Brooklyn.

On motion of Mr. Schaeffer the by-laws were suspended. On motion of Mr. Roberts the secretary was instructed to cast one ballot for the election of Mr. Schott.

Mr. Leng requested Mr. Southwick to take the chair while he delivered his remarks concerning the Cicindelidæ.

Mr. Leng compared his Revision published in 1902 in which 90 species and 59 varieties were described with the Systematic Index published by Dr. Walther Horn in 1905, in which 66 of the same forms were treated as species, the remainder as subspecies, aberrations, varieties or synonyms. Mr. Leng stated that the 15 years which Dr. Horn had given to the study of the family warranted an impression that his conclusions must be substantially correct, but a possibility remained that some alteration might still be necessary. Mr. Leng exhibited the described varieties of *Cicindela longilabris* and *Cicindela tranquebarica* and claimed that the difference between the specimens shown did not support Horn's conclusion that *laurentii* Schaupp was a synonym of *C. longilabris* or that *C. obliquata* Kirby was a synonym of *C. tranquebarica*. Mr. Leng spoke of the distribution of these varieties as well as of the difference in their color and markings and maintained that each of these names represented a well-defined and distinct geographical race. He also questioned the advisability of using the terms "subspecies," "aberration" and "variety" in place of

the general term "variety," and after explaining Walther Horn's endeavor by using them to make the list reflect more accurately the actual relationship between the insects, submitted the question to the society.

In discussing the question several spoke particularly against using the term "aberration" as it was a perversion of the usual meaning of the term. It seemed to be the general opinion that though Dr. Horn's scheme was good, he had been too radical in the use of terms, and that relationship could be accurately shown by using the terms "species" and "varieties."

Mr. Beutenmüller exhibited a collection of Mexican and Central American Coleoptera and made the following remarks concerning the collection: Through the kindness and generosity of F. du Cane Godman, Esq., the well-known English scientist and editor of the famous work entitled *Biologia Centrali-Americana*, the Museum recently received as a donation an extremely valuable collection of beetles from Mexico and Central America.

This collection is of unusual scientific importance, it being a part of the material upon which the volumes of this publication on the Coleoptera were based. In it there are upward of 4,000 specimens representing 1,679 species, many of which were described as new in the *Biologia* by Messrs. Sharp, Bates, Champion, Gorham, Baly, Jacoby, and other well-known specialists in Coleoptera. The authoritative identifications of the species in this collection make it of especial value to students and it will be of much assistance in the labeling of a large quantity of hitherto unidentified material in possession of the Museum and in private collections.

Mr. Beyer gave some interesting notes on *Oncideres quercus* of which an abstract is not produced as the remarks are published in the JOURNAL.

As Mr. Bischoff was absent the reading of his paper was postponed.

Mr. Southwick exhibited a paper on the Mosquitos of Para, Brazil.

Mr. Schaeffer exhibited the first minute-book of the society, covering the years June 29, 1892, to December 18, 1900.

Mr. Davis exhibited the larval and adult fly of *Microdon tristis* bred from larvæ taken at Newfoundland, N. J., in nests of *Formica schaufussi*.

Mr. Leng spoke of the death of Mr. August Luetgens who, though not a member of the society, was known to most of the members.

Society adjourned.

MEETING OF FEBRUARY 4, 1908.

Held at the American Museum of Natural History. President Leng in the chair and fourteen members in attendance.

The librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

The Dragonflies of Burma and Lower Siam, II, by E. B. Williamson.

Entomologisk Tidskrift, Vol. XXVIII, 1907.

The Insect World, Vol. XI, No. 2.

Notes on Brephidæ by John B. Smith.

New Species of Noctuidæ for 1907, Nos. 1 and 2, by John B. Smith.

Notes on the Species of Amathese Hon. by John B. Smith.

Dr. Wheeler, chairman of the special lecture committee, stated that Dr. Howard had consented to lecture at the Museum on the evening of February 18.

A committee of three was appointed to draft resolutions recognizing the valuable

services of the late Mr. Jessup. The president appointed on this committee Mr. Southwick, Dr. Wheeler and Dr. Osburn.

The resignation of Mr. Morgan Hebbard was read and accepted.

The first paper of the evening was that of Mr. Roberts who gave some "Notes on the Species of *Laccophilus*." In studying this genus Mr. Roberts said he had found some difficulty in following Dr. Sharp, and as an illustration he read from Dr. Sharp's work on Dytiscidæ several passages commenting on the structures of the group, such as the prosternal process and coxal file. Some of the species very closely resembled each other and the description of *L. maculosus* as given by Dr. Sharp might apply to *maculosus* or *decipiens*. Among other things, Dr. Sharp suppresses Say's *proximus* but in this he is in error as he apparently failed to recognize the species. Upon carefully studying the group, Mr. Roberts found that this species, as well as the others, could be recognized by the coxal file. This character was recognized only in the males and as yet no character had been found by which the females might be separated. *L. proximus* of Say is a commonly recognized form and the description fits Aubé's *americanus* which is not found in our collections. Upon carefully comparing a specimen of *americanus* from the Antilles, Mr. Roberts found that the two species were identical and hence the latter species would become a synonym. In his collection all were represented save *pumilio*, the type of which was in the LeConte collection and came from Enterprise, Florida.

Dr. Wheeler asked in regard to the use of the coxal file as a stridulating organ and Mr. Roberts said it would be very difficult to determine as it was such a minute structure.

Mr. Leng asked in what other groups good characters in the males could be found while the females were difficult to determine. Dr. Wheeler stated that this was the case in the Dolichopodidæ among Diptera. Mr. Davis cited the species *Diplax obtrusa* and *Diplax rubicundula* in which the females were similar. Dr. Osburn said that Mr. Walker, of Toronto, was studying *Æschna constricta* and found that three distinct species were included under that name. He also stated that in the Syrphidæ the females of some species could not be referred even to the genus while the males were readily determinable. In the Coleoptera Mr. Schaeffer cited *Copris carolina* and *colonus*, the females of which were similar while the males could be separated by the characteristic tubercles. He also mentioned Professor Smith's work on *Lachnosterna* where he had made use of the genitalia for separating the species.

The second paper of the evening was by Mr. Schaeffer who gave "Notes on Some Coleoptera." He first discussed the various species of the genus *Oncideres* and said that the apparent variety of the insects he believed was due to the fact that they emerged late in the season when little collecting was done and that they clung very tightly to the twigs when disturbed so that in beating, unless they fell into the umbrella at the first stroke, they would not be apt to be taken. The first year that he was in Texas he had not captured any specimens of *O. pustulatus* but had found many branches infested with the larvæ under acacia trees, and from these he had obtained a number of the adult insects. Infested branches could be recognized by the stridulating of the larvæ within them. *Oncideres texanus*, however, was apparently rare as only a few infested branches could be found. The following species and their work were exhibited: *Oncideres angulata* and girdling on hickory, *O. pustulata*

and work of larvæ in *Acacia fornesiana*, *O. texanus* and work in *Acacia flexicaulis* and *O. quercus* and work in black oak. He also commented on the collection of beetles taken in Mexico for the "Biologia" and recently presented to the American Museum of Natural History. These, he believed, would be of little value for comparing with southern Texas or Arizona material as the latter was similar to that of northern Mexico, where very little collecting for the Biologia had been done. In connection with this he exhibited some Arizona and southern Texas Cerambycidae and some of the Biologia material to show the difference between them.

Dr. Wheeler exhibited a lantern slide of butterflies recently made in the Museum by the Lumière color process.

Dr. Zabriskie said that Dr. Stebbins, of the New York Microscopical Society, had been working along the same line and had obtained some very good results and so far as the slides had been tested in the lantern the heat had not appeared to injure the colors.

Mr. Davis stated that recently some ants of the species *Camponotus pennsylvanicus* had been found in his room and had come from an oak log placed there. Two of these were placed in a bottle with a turtle, *Kinosternon pennsylvanicum*, and had attacked it and had bitten so hard that the heads remained attached to the turtle's neck after the bodies had been removed. The turtle with attached insects was exhibited. This habit is made use of in South America where, Dr. Wheeler stated, a certain species is allowed to bite and so bind together a cut or similar wound. The bodies can then be cut off and the heads will remain attached until removed, thus holding the wound together until it heals.

Society adjourned.

H. G. BARBER,
Secretary.

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Authors of each contribution to the JOURNAL shall be entitled to 2 separates of such contribution without change of form. If a larger number be desired they will be supplied at cost provided notice is sent to the Editor before the page proof has been corrected.

Price List of Entomological Publications

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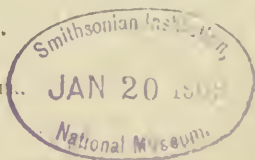
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No. 4.

COCCIDÆ OF THE CONIFERÆ. SUPPLEMENT NO. 1. DESCRIPTION OF TWO NEW SPECIES.

BY GEORGE A. COLEMAN,
SISSON, CALIFORNIA.

(WITH PLATES IV AND V.)

***Pseudococcus cupressi*, new species. (Pl. IV, Figs. 1-4.)**

Female and Ovisac. Length 6 mm., width 3.5 mm.; color olive-brown; body sparsely covered with white powdery wax; margins with tufts of same; last abdominal segment with large tuft on either side of anal ring; a wax cylinder about .5 mm. in length protruding from above anus; dorsal surface marked by two dorso-median and marginal rows of large black spots at each segmental margin. Formula for antennal segments: 3, 4, 8 (2, 5) (1, 6), 7; third largest, seventh shortest. Legs 2 mm. in length, reaching slightly beyond margin of body when walking.

Young. Olive-gray in color; length 9 mm., width .52 mm. Antennæ 7-jointed, length .5 mm., third joint longest.

Egg — in whitish waxy cocoon — 45μ long and 30μ wide.

Adult Male. Length, head and body, 3 mm., wing 3.5 mm., antennæ 3.5 mm., caudal appendages 3 mm. Color: body dark gray with lighter margins, head and thorax black, antenna gray-black, legs similar to antennæ, wings smoky, caudal appendages white. Antennæ 10-jointed, sixth joint longest.

Life History. This species was discovered by the author on the Monterey cypress (*Cupressus macrocarpa*) at Cypress Point, near Pacific Grove, California, January 25, 1904. The female and young spend most of their lives clustered about the base of cypress cones, living on the sap which exudes from the base of the cone. The female begins to spin wax for her egg-sacs early in January and the eggs are deposited in the latter part of January or in February. The males

appear about the time the females begin to spin their egg-sacs and continue to appear through January, February and March. The young hatch out about April 1, and are active through the summer and fall months. About November 1 they disappear and are found from that time to January in the crevices of the bark and in open cones. The male cocoons are found mostly in open, dead cocoons.

***Xylococcus macrocarpæ*, new species.** (Pl. V, Figs. 1-3.)

Adult Female. Length 6 mm., width 3 mm.; shape oblong-oval; color dark olive-brown. Antennæ 1 mm. in length, light brown in color. Legs light yellow, extending slightly beyond margin of body. Antennæ 8- or possibly 9-jointed (the second joint is apparently divided into two, but the division is not often distinct); formula for 8-jointed antenna: 2, 1 (3, 8) (5, 6, 7), 4.

Eggs. Lemon-yellow, length .6 mm., diameter .35 mm.

Young (larvæ just hatched). Length .7 mm., width .3 mm.; antennæ 6-jointed (the 6th longest, 2, 3, 4, 5 subequal); color yellow.

Adult Male. Length: body 2 mm., width across thorax .8 mm., wings 3 mm. long by 1 mm. broad, expanse about 7 mm.; color of head and thorax dark brown, abdomen yellow, with bands of brown above and below, wings cinereous; veins blackish; only one distinct branch to discoidal vein.

Life History. So far as I have been able to trace the different stages and transformations in this species, the life history is almost identical with that of *Xylococcus betulæ* Pergande, as described in Bulletin No. 18, New Series, U. S. Department of Agriculture, Bureau of Entomology. About the only difference I can discover is that in the cysted stage the females do not gather in groups, but are quite evenly and singly distributed under the bark, the wax tubes being found in crevices in the bark.

DESCRIPTION OF THE PLATES.

PLATE IV.

(*Pseudococcus cupressi* sp. nov.)

- FIG. 1. Adult female (dorsal view).
- FIG. 2. Same (ventral view); *a*, leg; *b*, antenna.
- FIG. 3. Young individual; *a*, leg; *b*, antenna.
- FIG. 4. Head of male; *a*, leg; *b*, antenna; *c*, penis of same.

PLATE V.

(*Xylococcus macrocarpæ* sp. nov.)

- FIG. 1. Adult female; *a*, antenna; *b*, leg of same.
- FIG. 2. Adult male; *a*, leg of same.
- FIG. 3. Young individual; *a*, leg; *b*, antenna of same.

SOME NEW NORTH AMERICAN PHORIDÆ.

BY CHARLES T. BRUES,

MILWAUKEE, WIS.

The new species described below are several recently sent to me for identification, and as all are forms which will be easily recognized on account of their striking characters, I am describing them at the present time.

***Phora variabilis*, new species.**

Female. Length 3.7-4 mm. Black, the antennæ, palpi and legs yellowish brown, and the fourth to sixth abdominal segments reddish orange. Head shining black, front scarcely broader than high; lowest reclinate bristles four in number, very closely placed at the prominent median lobe of the anterior margin of the front; second row slightly curved, the median ones farther from each other than from the lateral ones; third row straight, equidistant; occipital row as usual. Antennæ small, oval, brown or fulvous, the dorsal arista without trace of pubescence. Palpi moderately stout, brownish yellow and strongly bristly; proboscis short, retracted. Cheeks with one large and two smaller macrochaetæ. Postocular cilia stout but not enlarged below. Dorsum of thorax subshining, black, pubescent, rather elongate in shape as is also the scutellum; one pair of dorsocentral macrochaetæ and four equally strong scutellar bristles. Abdomen with the second and sixth segments elongated, the first and second except for pale capillary margins black; third broadly orange-red apically; fourth to sixth orange-red as is also the venter. Apical half of abdomen strongly hairy, especially below. Legs brownish yellow; anterior tibiae with a single bristle at the middle; middle ones with a dorsal pair at the basal third and another dorsal one at the apical third; posterior pair with a dorsal pair in the type (or a group of three in one specimen) at the basal third, and an external apical one in addition to two rather slender spurs. Wings hyaline, veins brownish yellow; costal vein reaching slightly beyond the middle, not at all swollen, with very fine and closely placed cilia; second vein ending midway between the humeral cross-vein and the tip of the third; third vein bristly, or rather hairy, as far as the origin of the second, its furcation very acute, the second and third lying very close together; fourth sharply curved at the base, straight beyond and parallel with the fifth, ending just before the wing tip; fifth, sixth and seventh but slightly curved. Knob of halteres blackish; pedicel pale.

Two specimens: type, Pullman, Wash., July 7, 1908 (A. L. Melander); cotype, Florissant, Colo., June 28, 1908 (S. A. Rohwer).

This species is closely similar to several European ones. It comes nearest perhaps to *P. curvinervis* Becker, originally described from Europe, but which also occurs in Washington state. However, the second abdominal segment is lengthened and the chaetotaxy of the hind

tibiæ different, as well as the color of the abdomen. From *P. abdominalis* Fall., which it resembles in color, it can be distinguished by the bristly third vein, and from *P. thoracica* Meig. by its dark halteres, non-thickened costal vein and orange-red abdomen. The difference in the chætotaxy of the hind tibiæ in the two specimens before me is puzzling, but careful scrutiny reveals no other distinguishing differences of importance and I am convinced that both belong to a single species.

***Phora occidentalis*, new species.**

Female. Length 2.4-2.6 mm. Black, the anterior trochanters and knees honey-yellow. Wings infuscated, especially anteriorly and along the veins. Head rather small, the front very slightly broader than high, polished and impunctured. Lower pair of reclinate setæ small, widely separated; second row of four scarcely above the lower pair, equidistant and forming a nearly straight line; third row straight; occipital row as usual. Antennæ small, rounded, the arista strongly pubescent. Palpi slender, bristly only toward the tips. Proboscis short, membranous. Cheeks each with several macrochætæ. Mesonotum elongate, shining, sparsely hairy, with one pair of dorsocentral macrochætæ. Scutellum with four marginal bristles, the lateral pair however considerably weaker than the median. Abdomen as usual, the second segment not elongated. Surface of abdomen sparsely hairy. Legs short but slender; anterior tibiæ without bristles; middle ones with a pair of delicate bristles at the basal third, hind pair with a single weak bristle just before the middle. Wings infuscated, especially on the anterior half and along the course of the veins, narrow in outline. Costal vein reaching well beyond the middle of the wing, with short, sparse, and delicate cilia, quite distinctly thickened on its apical half. First vein ending three fourths as far from the tip of the third as from the humeral cross-vein; second ending midway between the third and first, originating very far basally, nearer the origin of the fifth than of the fourth vein, and just opposite to the tip of the first; third vein bristly as far as the furcation which is about at its middle; fourth vein rather sharply curved at its extreme base, straight elsewhere, and ending well before the wing tip; fifth nearly straight; sixth sinuate; seventh very distinct at the base, but not attaining the wing margin. Halteres black.

Two specimens, both sent me by Professor A. L. Melander, one from Moscow Mt., Idaho, June 17, 1904, and the other from Pullman, Wash., May 5, 1907.

This is a very peculiar species owing to the great length of the fork of the third vein. This peculiarity will at once serve to distinguish it from any other described species that I have seen.

***Plastophora* Brues.**

Brues, Ann. Mus. Nat. Hung., III, p. 551 (1905).

Coquillett, Canadian Entomologist, XXXIX, p. 208 (1907) (*Pseudacteon*).

Brues, Entomological News, XVIII, p. 430 (1907).

Plastophora juli, new species.

Female. Length, including the extruded ovipositor, 2 mm. Brownish yellow, the ocellar tubercle, tips of posterior femora and abdomen, except narrow margins of segments 2-5, black. Head normal, front wider than high, the ocellar tubercle and median groove well developed, four proclinate setæ, the lower pair considerably smaller; lowest reclinate row of four setæ, forming with the upper proclinate pair a slightly curved equidistant series; middle row equidistant, nearly straight; ocellar row very large and strong. Cheeks each with two stout macrochaetæ below and a weaker pair both anteriorly and posteriorly. Palpi large, of normal shape, with moderate bristles. Antennæ oval, the arista distinctly dorsal, thinly pubescent. Mesonotum elongate and narrower than usual; scutellum more than one half as long as broad; one pair of dorsocentral macrochaetæ and four scutellar bristles. Abdomen to the tip of the sixth segment of the usual form, the seventh long, tubular, encasing the base of the extruded ovipositor; the latter compressed, knife-shaped, and slightly arcuated downward toward the tip which is obliquely truncate. Second to fifth segments gradually decreasing in length, sixth, seventh and ovipositor longer, subequal, each slightly longer than the second. Second segment with a lateral bunch of bristly hairs. Legs rather slender, setæ on middle and hind tibiæ weak and short although distinct. Wings yellowish hyaline, veins pale brown; costal vein reaching very slightly beyond the middle of the wing, its bristles of moderate length and closely placed. Tip of first vein slightly, but distinctly nearer the tip of the third than the humeral cross-vein; fork of third vein obtuse, the second vein nearly perpendicular to the costa and enclosing a large cell; four light veins; fourth vein evenly but slightly curved; fifth, sixth, and seventh but little curved, the fifth as far from the wing tip as the fourth. Halteres pale yellow.

Described from two specimens collected by Dr. S. Graenicher at Milwaukee, Wis., during July, 1908, and very generously given to me for study. He found them attacking a small myriapod (*Julus* sp.) upon which they were attempting to oviposit. From this the species is undoubtedly a parasite of these myriapods, although an attempt to breed a second generation of the flies failed, probably on account of the premature death of the *Julus* in captivity.

This is the second species of the genus to be discovered in North America. It differs from *P. crawfordii* Coq. (1907) by its oval antennæ and differently shaped ovipositor as well as in minor details. The latter is an ant parasite attacking the well-known fire-ant (*Solenopsis geminata*) in Texas.

STUDIES ON MYRMECOPHILES. III. MICRODON.

BY WILLIAM MORTON WHEELER,

BOSTON, MASS.

Few insects have occasioned more perplexity in the minds of entomologists than the species of *Microdon*, or, more accurately speaking, than the larvæ and pupæ of *Microdon*, for no tyro in entomology could fail to recognize the imagines as Syrphid flies. So repeatedly have even experienced observers been deceived by the singular elliptical larvæ and puparia, that the history of the genus is unusually instructive. The adult flies have been described under a variety of generic names: *Microdon* (Meigen, 1803), *Aphritis* (Latreille, 1805), *Ceratophya* (Wiedemann, 1830), *Chymophila* (Macquart, 1834), *Dimeraspis* (Newman, 1838), *Mesophila* and *Ubristes* (Walker, 1849 and 1856), and, to add to the confusion, Conrad, in 1842, described a genus of Silurian bivalves under the name of *Microdon*. The larva of the common European species, *M. mutabilis*, was first seen by von Heyden, who in 1823 described and figured, but refrained from naming it. He says that he does not believe it to be "the larva of an insect (perhaps a species of fly) for its whole organization, especially the structure of its mouth-parts, is too different from that of any insect larva" known to him. So he concludes that "it is much more probably a mollusk, but if such be the case, it must constitute a new and extraordinary genus." The following year (1824) von Spix found the larva of the same species of *Microdon*, and believing it to be a slug, named it *Scutelligera amerlandia*. Thereupon von Heyden published a second paper on the creature and dubbed it *Parmula cocciformis*, for the joy of naming things was as great in the early decades of the nineteenth century as it is to-day. The name *cocciformis* seems to have suggested to Burmeister (1839) that the creature was the "larva of a *Coccus* living on oaks"; at any rate, he enumerates it among the *Coccidæ*. The same year Schlotthauber presented to the German naturalists assembled at Pyrmont a carefully written paper with illustrations to prove that the organisms described by von Heyden and von Spix as mollusks, were really the larvæ of *Microdon mutabilis*. Unfortunately this paper was never published; a brief reference in Oken's "Isis" of 1840 being apparently the only record of its contents. In 1845 Elditt

endeavored to make good this loss to science in an excellent article on the metamorphosis of the insect. But the resemblance of the larval *Microdon* to a naked mollusk has continued to breed new generic names down to the present day. Prof. T. D. A. Cockerell calls my attention to a recent article by Simroth (1907), in which he describes what is evidently the puparium of a *Microdon* or of some allied Syrphid genus, from Cape Flats, South Africa, as a new genus and species of slug (*Ceratoconche schultzei*) to be placed "between the genera *Tectacella* and *Apera*." Simroth actually interprets the posterior tubercle of the puparium as a vestigial shell ! There is apparently no reason why unusual *Microdon* larvæ and pupæ, as fast as they are brought to light in various parts of the world, should not become the types of futile genera of naked mollusks, at least till the millennium arrives, when naturalists no longer itch to attach a name to everything that swims within their ken.

The genus *Microdon* embraces about 70 described species, and seems to be cosmopolitan in its distribution. Many of the species, however, are highly variable and have been but little studied, so that it is impossible at present to give more than a general account of their number, range and habits. According to Schiner (1864) and Verrall (1901), there are only three or four species in Europe. Aldrich (1905) enumerates 28 from North America. Lea (1893) has found the larvæ of a form, which he calls *M. variegatus*, in New South Wales. Simroth, as we have seen, has described the puparium of a South African species, and several have been recorded from South and Central America and Madagascar (Sharp, 1899 ; Wasmann, 1894).

The larval and pupal stages of these singular insects are found only in the nests of ants, wasps and termites. Wasmann (1890) seems to be the only author who has seen them in wasp nests. In his list of myrmecophiles and termitophiles (1894) he mentions their occurrence also in the termitaria of Madagascar and Brazil. Most frequently, however, both in temperate and tropical regions, the larvæ and puparia are found living with ants. In these stages the insects are gregarious, as a rule, so that several may be seen clinging to the walls of the galleries and chambers. They seem to live indifferently in nests in the soil, under stones, under the bark of trees or in the cavities of branches. The larvæ, while young or partially grown, often inhabit the deeper recesses of the nests, but when they reach maturity and are ready to pupate, they emigrate to the surface

and are then found near or at the entrances. They creep very slowly, with a wave-like motion of the flat and viscid ventral surface, which so closely resembles the foot of a slug, and keep the fringed border of the body in close contact with the surface over which they are moving. The anterior end, however, is occasionally raised for a few moments. At such times one may see the small pointed head of the larva moving about uneasily under the fringed border as if in search of food. What this food is, has not been determined, Laboulbène (1882) surmised that it might be the ant larvæ, but I am inclined to believe that it is the minute pellets of food, which, after their moisture has been extracted, are ejected from the hypopharyngeal pockets of the worker ants. These pellets are scattered about the nest, especially about the superficial galleries, and though hard and dry, must contain considerable nutriment. They are probably eaten not only by the *Microdon* larvæ but also by many other synœketes (*Clytra*, *Coscinoptera*, etc.).

The larvæ of the common European and North American *Microdons* are usually of a dirty white or drab color, with yellow or brown fringes of hair-like processes around their creeping sole, and a prominent, heavily chitinized tubercle near the posterior end. Usually no traces of segmentation are to be observed in their elliptical bodies, but in some adult larvæ of *M. tristis*, just before pupation and after their upper surfaces had been dried by exposure to the air, I have been able to discern in certain lights a distinct division of the body into seven or eight subequal segments. When the time for pupation arrives the larva remains stationary on its creeping sole, contracts somewhat, becomes harder and more convex and of a deeper brown color. The reticulations or markings, with which the upper surface is sometimes ornamented, become more pronounced, and a pair of short tubercles or protuberances make their appearance near the anterior end in addition to the single respiratory tubercle at the posterior end.

I am convinced that there is but one annual brood of these insects, at least in temperate regions, and that the larvæ, after passing the winter in the ant-nest, pupate in April or May. The flies hatch early in June and are much less active than other Syrphidæ. They are most frequently taken in sweepings in meadows or rather low grounds. During July young larvæ may be found in the nest and these mature by autumn. I believe, therefore, that Mann (1882) must be mistaken when he claims to have seen several specimens of

Microdon globosus issuing from a hole in the woodwork of a house and infers that they had been hibernating in this retreat.

The habits of the European *Microdons* have been studied by a number of entomologists: Bertkau (1889), Bignell (1891), Elditt (1845), Gadeau de Kerville (1884), Laboulbène (1882), Mayet (1882), Poujade (1883*a*, 1883*b*), Schenck (1852), Verhoeff (1892), Wasmann (1891, 1894), Wissmann (1848), and others. Of the two common species, *M. mutabilis* L. and *M. devius* L., the former is cited by Wasmann as occurring in the nests of *Formica rufa*, *fusca* and *rufibarbis*, and of *Lasius niger*, *brunneus* and *flavus*, the latter in nests of *F. fusca*, *sanguinea* (with *fusca* slaves) and *L. fuliginosus*.

So far as I am able to ascertain, but one of our numerous North American species, *M. tristis* Loew, has been bred from the puparium. Packard (1869) does, indeed, figure a puparium and fly which he refers to *M. globosus* Fabr., from a specimen taken by Sanborn at Andover, Mass., but I have recently examined the specimen, which is in the Museum of Comparative Zoölogy, and find it to be without doubt a puparium of *tristis*. Lintner (1885) reproduced Packard's figure and description, which he also erroneously attributed to *globosus*. Both the Museum of Comparative Zoölogy and that of the Boston Society of Natural History contain specimens of *tristis* mounted on the same pins with the puparia from which they were reared. During May, 1907, Mr. W. T. Davis reared the flies from a lot of twenty-four *tristis* puparia which I found at Newfoundland, N. J., in a nest of *Formica schaufussi*, and during the spring of 1908 I reared a number from puparia found at Bronxville, N. Y., and Paterson, N. J. In both of these localities the host ant was *schaufussi*. My collection also contains specimens of the adult insects and puparia taken in the following localities and with the following ants: Manchester, N. J., with *Formica* (species undetermined); Colorado Springs, with *F. rufa obscuripes* Forel (July); Colebrook, Conn., with *F. difficilis* var. *consocians* Wheeler (June 30); South Harpswell, Maine, with *F. sanguinea aserua* Forel (July). There are puparia of *tristis* in the Museum of Comparative Zoölogy from Loon Lake, Washington; Binghampton, N. Y., and Boston, Mass. (Henshaw).

In 1906 I published a few notes on some larvæ of *tristis*, one of which lived in an artificial nest of *F. consocians* from July 7 till September 10. On the former date I found three young larvæ in a nest of this ant at Colebrook, Conn., together with some empty

puparia from which the flies must have escaped during the previous spring. The ants resented my interference by moving to a new nest. On July 25 I found two more partly grown larvæ in the deserted formicary, but these were weak and emaciated. This shows that the *Microdons* do not accompany the ants when they move, and that the presence of the latter is essential to the well-being of the former. The emaciated condition of the abandoned larvæ is easily accounted for, if they feed, as I believe they must, on the ejected hypopharyngeal castings of their hosts.

The larva of *M. tristis* (Fig. 1) is 8-10 mm. long, opaque, pale, dirty brown or dark drab above and lighter beneath. The border is brown and striated and bears a simple fringe of short, flattened and pointed hair-like processes. The convex dorsal surface is covered with a coarse reticulum consisting of pale gray, cord-like elevations, which converge toward the anterior end and the posterior tubercle. On

closer examination the convex surface is seen to be divided into five subequal areas by four longitudinal strips which are rather free from reticulations. The posterior tubercle is short, robust, rounded, opaque, yellow, and covered with minute papillæ of the same color as the reticulum on the dorsal surface. This tubercle is surmounted by the two reniform anal stigmata, which are sometimes connected by a bridge. They are dark brown and shining.

The puparium is of the same size as the adult larvæ, but more convex and dark brown in color. Its sculpture is like that of the larva, but there are two prothoracic tubercles, each less than twice as long as broad, slightly diverging and somewhat obliquely truncated at their tips, which are

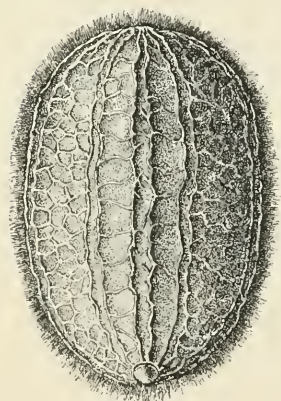


FIG. 1. — Larval *Microdon tristis* Loew; dorsal aspect. $\times 6$.

shining and covered with minute papillæ.

The following additional observations on *tristis* were made during the past spring. April 19 I found a flourishing colony of *F. schaufussi* under a large flat stone in a sloping pasture at Bronxville, N. Y. The nest contained twelve adult larvæ and twelve puparia of *tristis*, all attached to the smooth earthen walls of the galleries either at their entrances or not more than 3 cm. below the surface of the soil. In

the flat superficial chambers there were also several of the earthen cases of *Coscinoptera dominicana* containing pupæ. Part of the *schaufussi* colony was confined in a Fielde nest together with the *Microdons* and the *Coscinoptera*. The ants paid no attention to either of these insects. By April 22 all the *Microdon* larvæ had attached themselves to the glass floor of the nest and had pupated. May 15 and 16 ten of them hatched, and eight of them hatched on May 20; the six remaining failed to develop. The flies emerged by breaking off the cover formed by the tripartite anterior third of the dorsal portion of the puparium and were at first of a dull drab color. Their bodies were moist and their covering of pile was glued to the chitinous surface. While in this stage they walked about among the ants without being noticed or, at any rate, without being molested. After a few hours, or sometimes much sooner, their wings had expanded and were folded over each other on their backs, their integument had acquired the adult metallic coloration and the pile had dried and become conspicuous. They remained very quiet except when rudely touched. Then they emitted a loud humming sound, but without moving their wings. This peculiar behavior has also been noticed by Bignell (1891) in *M. mutabilis*. The humming attracted the ants, which at once seized the defenseless creatures by the legs or wings and drenched them with formic acid. This killed them almost instantly. After seven had been dispatched in this manner, I removed the others from the nest in order to save them. These observations show very clearly that the adult *M. tristis* is treated with pronounced animosity even by ants among which for many months it has been tolerated with indifference as a larva and as a pupa. It is probable that the migration of the full-grown larvæ to the entrances of the nest and their pupation in the superficial galleries are an adaptation to making it as easy as possible for the adult flies to escape to the open fields without being noticed by the ants. All of my flies hatched at night and I believe that this must be the time of emergence also out of doors. The nights in May are apt to be cool, so that the ants would be in a torpid condition or huddled together in the lower chambers of the nest, and would not molest the flies while they were expanding their wings and perhaps even mating and ovipositing in the nest. In several instances, as in the case of the *F. consocians* nest mentioned above, I have found empty puparia in nests containing partially grown *Microdon* larvæ. This would indicate that the flies are apt to oviposit in the

very nests in which they have passed their larval and pupal stages. Verhoeff (1892), however, has seen the adult flies hovering about and apparently attempting to oviposit among the ants on the outside of the nest.

M. tristis, like other members of the genus, is highly variable in size and coloration. To some extent this variability may be geographical, since this species is known to range from the Mackenzie River to Virginia and from Maine to Washington and Oregon. Williston (1886) describes a var. *ruficrus* from Connecticut and regards *M. cothurnatus* Bigot from Oregon as being merely a variety of *tristis*. I have found still another variety which cannot be due to geographical causes, since it was bred from one of the twenty-four puparia taken in the *schaufussi* nest described above. The puparium from which it emerged was indistinguishable from the others, but the adult insect was covered with rich orange-yellow pile, whereas the seventeen other specimens had the pale yellow or silvery pile of the typical *tristis*. I have seen two other specimens of this orange variety in the American Museum of Natural History. Both of these were collected by Mr. W. Beutenmuller, one at Grant's on the Indian River, Fla., the other in sweepings with several specimens of the typical *tristis* and *globosus* in low ground at Katonah, N. Y. (June 4-14). This singular variety suggests a number of questions: Does it indicate that *M. tristis* is dichromatic like certain species of birds? Or is it a mutant? And if a mutant, is it an adaptation to more intimate symbiotic relations with the ants? In other words, does the orange-yellow pile have the same significance as the trichomes of the true myrmecophiles (symphiles), and would its possessor be more amicably treated by the ants than the typical *tristis*? I could, perhaps, have answered this last question, had not my specimen died soon after leaving its puparium.

M. globosus Fabr. and *M. fuscipennis* Macq., two other North American species not uncommon in collections, have not yet been bred from their puparia. I have seen a larva and puparium which are quite unlike the corresponding phases of *tristis* and probably belong to one or the other of these species. The larva measures 8-11 mm. It is opaque, pale brown above and lighter beneath. The dorsal surface is smooth and not covered with reticulations, but in dried and alcoholic specimens may be vermiculately wrinkled from contraction. The border has two fringes of golden yellow hairs, separated by a rather broad space crossed by sparse transverse ridges.

The more dorsal fringe consists of very delicate, short, curly hairs, while the ventral fringe is borne on a diaphanous striated lamina and is made up of flattened hairs, with long, slender, flexuous tips. The anterior border of the body is distinctly notched in the middle. The posterior tubercle is very long (1.7 mm.), with a ring-like groove around its base, and terminates in a pair of short blunt processes, each of which bears one of the anal stigmata. The whole surface of the tubercle is somewhat shining and finely rugulose.

The puparium measures 11 mm. It is smoother, more convex and somewhat darker brown than the larva. The anterior tubercles seem to be replaced by a pair of large, broadly elliptical discs or spots, representing less heavily chitinized areas of the puparial wall.

Larvæ and puparia of this description were found in a nest of *F. fusca* var. *subsericea* at Fort Lee, N. J., during April. I have some larvæ also from two localities in Massachusetts, collected in nests of the same ant by Mr. A. P. Morse and Mr. A. C. Burrill, and there are in the Museum of Comparative Zoölogy several specimens taken in the same state by Mr. E. A. Samuels.

We may conclude from the foregoing account that the typical and most frequent hosts of *Microdon* in the north temperate zone are the species of *Formica*. In tropical and subtropical regions, however, where this genus of ants is absent, the hosts belong to different and often to very diverse genera. Wasmann (1894) mentions *Camponotus hildebrandti* as the host of a *Microdon* in Madagascar. I have given an account (1901) of the larva of another undetermined species from the nest of *Pseudomyrma mexicana*, one of the fiercest of our American ants, and Brues (1903) has described and figured a very peculiar puparium, which probably belongs to a genus allied to *Microdon* and was taken in California by Prof. H. Heath in the nest of a very small black Myrmicine ant, *Monomorium minutum* Mayr. I find no mention of the species of ants with which the other recorded tropical and subtropical *Microdons* have been taken. We should expect the Australian forms to occur in the nests of *Iridomyrmex* species, the South African forms with the larger species of *Plagiolepis*.

The relations of *Microdon* to its hosts appear in an interesting light if we compare this insect with *Cremastochilus*. The larval and pupal *Microdon* are synœketes and are usually indifferently tolerated. Occasionally, however, the ants attack them even in these stages although they are well protected by their hard skins and marginal

fringes. The imaginal insects are treated as synechthrans, or persecuted intruders, and are quite defenceless. The larval and probably also the pupal *Cremastochilus* are synechthrans, or at any rate the ants would destroy them if they did not protect themselves by hiding away in the soil. The adult beetle may become indifferently tolerated, though it seems generally to be treated with hostility. Still it is well protected by its hard armor, so that it walks about the nest with impunity like the larval *Microdon*. Thus each of these myrmecophilous genera has its Achilles heel. At first sight this seems to show a lack of adaptation in a portion of the life cycle (larval and pupal stages in *Cremastochilus*, imaginal stage in *Microdon*), but a broader view suggests that what appears as a defect is really an advantage, both to the parasite and its host, for it prevents the former from exceeding a proper numerical relation to the latter. In other words, it is better for *Cremastochilus* and *Microdon* to sacrifice individuals and thus become rather rare forms, than to over-run the colonies and seriously disturb the domestic economy of their hosts.

ADDENDA.

To the account of *Cremastochilus* and *Heterius* given in the former studies of this series, I would add the following notes:

During the past summer I succeeded in finding the larvæ of *Cremastochilus castaneæ* in a nest of *Formica fusca* var. *glacialis* Wheeler, at South Harpswell, Me., and in rearing the beetles. I have described the larval and pupal stages in a recent paper (The Ants of Casco Bay, Maine, With Observations on Two Races of *Formica sanguinea*, Bull. Amer. Mus. Nat. Hist., XXIV, 1908, pp. 619-645).

In my summary of the records of *Cremastochilus*, I unfortunately omitted an important paper by Wickham (On Coleoptera Found with Ants. Fifth Paper. Psyche IX, 1900, pp. 3-5). This author cites *C. harrisi* as occurring with *Formica pallidefulva nitidiventris* Emery (Iowa, May 4) and *C. saucius* and *knochi* with *Pogonomyrmex occidentalis* Cresson (*opaciceps* Mayr). *C. saucius* was taken by E. J. Oslar at Denver, Berkeley and Salida, Colo. (April 10-July 11), *C. knochi* at Berkeley (April 8) and Chimney Gulch, Colo. (June 18). Oslar is quoted as stating that the former species occurs singly in the *occidentalis* hills at all times of the year, and Wickham adds that "it is difficult to get perfect specimens of this beetle, the legs often being much mutilated supposedly by the ants, which are large and fierce creatures."

It is probable that the primary, or regular hosts of these two *Crema-
tochili* are to be found among the many species of *Formica* which abound
within the geographical range of *P. occidentalis*, and that this latter
ant is merely a secondary, or accidental host. This is indicated by
the fact that I have recently received from Mr. W. Knaus a specimen
of *C. knochi* taken at Stockton, Utah, by T. Spalding in a colony of
a very pale form of *Formica sanguinea subintegra* Emery with *F. sub-
polita* slaves.

In the same paper Wickham mentions the occurrence of *Heterius
brunneipennis* in the nests of *Formica fusca* var. *subsericea*, in company
with *Ptomphagus parasita*.

Wasmann (The Guests of Ants and Termites, Entom. Record, XII,
1900, pp. 204, 205) publishes the following note on the common
European species: "Just one word about *Heterius ferrugineus* and its
allies. What seems easier at first sight than that a small Histerid,
which already possesses in its oval shape a kind of protection, should
force the ants to receive it as a lodger, and which would be tolerated
because of its being unattackable, and that finally the ants, taking
pleasure in licking it, would elevate it to the rank of a true guest.
But it is not as simple as it appears. In my observation-nests I
have had a number of *Heterius* for more than five years, and I have
come to the conclusion that it would be better for this species to be
merely tolerated. It is in truth licked by the ants, but this is not to
its advantage, as the ants do not feed it. It is often in great danger.
Formica sanguinea and *pratensis* play with it for a quarter of an hour
at a time, like a cat plays with a mouse, trying to get hold of its jaws,
so it is often hurt. Once a *Heterius* was so badly used by a *Formica
sanguinea* that it was half killed and nearly devoured. Whilst licking
the wounded beetle the ant's greed had been awakened."

In a later paper (Zur näheren Kenntnis des echten Gastverhältnisses
(Symphilie) bei den Ameisen- und Termitengästen, Biol. Centrallbl.,
XXIII, 1903, p. 207) Wasmann makes a few remarks on the adipose
tissue and notices the large size of the ovarian eggs of *H. ferrugineus*.
He kept a pair of these beetles for more than three years in an arti-
ficial nest, but they never oviposited and he saw neither larvæ nor
pupæ.

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NEW RHYNCHOPHORA. III.

BY CHAS. SCHAEFFER,

BROOKLYN, N. Y.

RHYNCHITIDÆ.

Eugnampus pallidus, new species.

Form of *collaris*, color testaceous. Head behind the eyes feebly narrowing to base; between the eyes a feeble fovea; punctuation sparse; beak carinate at middle; antennæ slender. Prothorax closely and rather coarsely punctate, with a feeble median impression. Elytra with rows of large, approximate punctures; intervals flat, with an irregular row of smaller punctures; surface as usual, clothed with semi-erect, pale hairs. Length 4 mm.

Huachuca Mts., Arizona.

The uniform pale color, the larger eyes of the male and the slender antennal joints distinguish *pallidus* from any of our other species.

Rhynchites macrophthalmus, new species.

Form and color of *æratus* but elytra shorter; punctuation of thorax and elytra less dense; beak in both sexes shorter and eyes much more prominent. Length 2 mm.

Brownsville, Texas.

This distinct little species seems to be closely allied to *æratoides* Fall, which is said to differ from *æratus* by the more closely punctate head and a longitudinal median impressed line on the first three ventral segments of the male. The punctuation of the head of *macrophthalmus* is nearly the same as in *æratus* but more evident, and the three ventral segments of the male are not longitudinally impressed at middle.

OTIORHYNCHIDÆ.

Panscopus alternatus, new species.

Form and color of *erinaceus* but a little more slender and alternate elytral intervals elevated, the others flat. Beak carinate, apex emarginate; between the eyes a narrow linear fovea; in front of the eyes transversely impressed. Antennal funicle a little more slender than in *erinaceus*, especially the first and second joints. Thorax as in *erinaceus* but surface more uneven. Elytra as in *erinaceus* but the intervals three, five and seven distinctly elevated, the first or sutural more or less so, the others flat; the elevated intervals with a row of pale setæ, which are absent on the flat intervals. Legs and underside of body as in *erinaceus*. Length 6-7 mm.

Black Mountain, North Carolina.

This species differs from *erinaceus* by the narrower beak, longer first and second funicular joints of antennæ, the absence of the strong arcuate impression between the eyes and the alternately elevated elytral intervals.

A few specimens of this species and *Paraplinthus shermani* were taken by sifting old leaves in September.

Pandeletejus cavirostris, new species.

Above clothed with small, rounded, yellowish-cinereous and brown scales; the dark scales condensed in an irregular spot of variable size behind middle; elytral intervals with sparsely placed, short, pale setæ. Beak deeply, arcuately emarginate-excavate at apex, the emargination limited behind by an arcuate ridge; median impressed line distinct. Eyes ovate. Scrobes arcuate, long, passing below the eyes nearly to the middle of the underside of the beak. First and second joints of antennal funicle equal in length but the first much stouter, the remaining joints short and nearly equal in length among themselves, the outer gradually increasing in width; antennal club three jointed, as long or nearly as long as the preceding six joints. Prothorax about as wide as long; sides very feebly arcuate, slightly constricted at base but not at apex. Elytra convex, about twice wider at base than the prothorax at base; sides slightly widening towards middle, thence arcuately narrowing to apex,

the latter separately rounded; disk with rows of moderately large, approximate punctures; intervals flat. Body beneath and legs rather sparsely clothed with elongate scales; first ventral suture rather strongly arcuate at middle. Anterior coxæ narrowly separated; anterior femora not very much stouter and longer than the others; anterior tibiæ feebly bent at apex and denticulate on the inner margin. Length 5 mm.

Brownsville, Texas.

This somewhat aberrant species differs from our others by the rather deeply excavate-emarginate apex of beak, wider and more convex elytra, longer antennal club, stronger arcuate first ventral suture and shorter front legs. The vibrissæ, or bristly hairs on the underside of thorax are also absent in this species, but are replaced by a very few pale setæ, which, however, are easily lost.

***Pandeletejus ovipennis*, new species.**

Elongate, oval; densely covered with pale and brown scales, the latter forming a vitta on each side of middle of thorax and also more or less evident on some of the elytral intervals. Beak triangularly emarginate at apex, about as long as wide, feebly narrowing to apex; median impressed line rather feeble. Eyes, small rounded. Scrobes feebly arcuate, distant from the eyes and rather long. Prothorax about as long as wide; sides feebly arcuate and slightly constricted at base and apex; disk somewhat coarsely but not densely punctate. Elytra at base about as wide as the prothorax at base; humeri absent; sides arcuate; the punctures of the regular series moderate; intervals more or less convex. Anterior femora moderately large; anterior tibiæ slightly sinuate on inner margin and with about four denticles. Underside of body densely scaly. Length 4 mm.

Brownsville, Texas.

The color of the upper surface is variable, some specimens are almost entirely dark, others nearly pale and the scales on the underside of body are in a few greenish.

***Pandeletejus robustus*, new species.**

Color and markings nearly as in *hilaris* but larger and of more robust form. Beak nearly quadrate, feebly narrowing to apex, which is slightly triangularly emarginate; disk with distinctly impressed median line. Eyes small, rounded. Scrobes short, nearly straight, not passing beneath the eyes. First joint of antennal funicle nearly as long as the two following joints. Prothorax as long as wide; sides broadly arcuate, constricted at base and apex, but more strongly at base; disk rather coarsely but not closely punctate and densely covered with cinereous and pale brown scales on each side of middle a longitudinal line of black scales, which is arcuate at middle. Elytra distinctly wider than the thorax at base, gradually widening towards apex; surface densely clothed with cinereous, pale and dark brown scales, the dark scales forming an irregular, oblique fascia below middle and some more or less distinct spots above and below this fascia. Anterior tibiæ slightly bent at apex, inner margin denticulate. Length 5-6 mm.

Huachuca Mts., Arizona.

The large size, more robust form, and the short antennal scrobes make this an easily recognisable species.

***Pandeletejus submetallicus*, new species.**

More or less greenish-metallic, generally more so on the underside than above. Beak short, transverse, deeply triangularly emarginate at apex. Eyes small, rounded. Scrobes rather strongly arcuate and long, but distant from the eyes. Antennæ testaceous, shining, scarcely at all pubescent; first joint of funicle stout, as long as the second and third together. Prothorax cup-shaped, wider at apex than base, sides feebly arcuate, rather strongly constricted near base, sinuate near apex; surface coarsely, not densely punctate. Elytra at base much wider than the thorax at base; sides gradually widening to about apical third, thence arcuately narrowing to apex; disk with regular rows of moderately large punctures; intervals flat, each with a single row of small, sparse punctures. First ventral suture strongly arcuate at middle. Anterior femora not elongate; anterior tibiæ not dentate within. Length 3.5 mm.

Beaver Co., Utah.

This little species looks somewhat strange among the other species of *Pandeletejus*, but as it has the principal characters of this genus I prefer to leave it here at present.

TABLE OF THE SPECIES OF PANDELETEJUS.

1. Beak deeply, arcuately excavate-emarginate at apex; the emargination limited behind by an arcuate ridge.....*cavirostris*
Beak more or less emarginate or truncate at apex; without ridge limiting the emargination2
2. Humeri absent, elytra oval with base as wide as the base of thorax, the latter feebly arcuate at sides with feeble basal and apical constriction.....*ovipennis*
Humeri distinct, base of elytra very distinctly wider than the base of prothorax. 3
3. Antennal funicle six-jointed; head and beak in front of the eyes concave; beak triangularly emarginate*rotundicollis*
Antennal funicle seven-jointed4
4. Head, when viewed laterally, very convex, thorax cup-shaped, distinctly wider at apex than at base, scales of upper surface uniform, not forming a pattern9
Head between the eyes feebly convex or flat; thorax at apex as wide or very slightly narrower than at base; scales of upper surface variegated, producing a more or less distinct design5
5. First joint of antennal funicle longer than the two following joints; basal thoracic constriction short and feeble*simplarius*
First joint of funicle as long as the two following joints.....6
6. Apex of beak truncate.....*hilaris*
Apex of beak emarginate.....7
7. Prothorax feebly arcuate at sides.....8
Prothorax broadly arcuate at sides; beak feebly triangularly emarginate at apex; form large and robust*robustus*

8. Alternate elytral intervals not elevated; general color grey.....*cinereus*
 Alternate elytral intervals more or less elevated; scales of upper surface brownish,
 with a more or less metallic lustre*subtropicus*
9. Scales on underside and legs greenish metallic, feebly so on the upper surface;
 beak sharply triangularly emarginate at apex; anterior femora scarcely longer
 than the others*submetallicus*

CURCULIONIDÆ.

Endalus robustus, new species.

Color as in *limatulus*, but the beak is stouter and scarcely curved and densely, rather coarsely punctate. Antennæ inserted at apical third. Eyes separated by a little more than their own width. Prothorax about twice as wide as long; sides evenly moderately strongly arcuate, apex constricted; surface more coarsely punctate than in *limatulus*. Elytra wider than the prothorax; humeri obliquely rounded; sides feebly narrowing to apical fourth; punctures of the striæ elongate; intervals flat, rather sparsely and finely punctate, each with a row of large, more distant punctures, each puncture bearing a short white seta. Underside covered rather densely with dirty-grey scales. Length 4 mm.

Brownsville, Texas.

This species has a shorter elytra than the male of *limatulus*, a different shaped and more strongly punctate prothorax, a stouter, flatter beak and more widely separated eyes.

Thysanocnemis balaninoides, new species.

Pale rufo-testaceous, scales yellowish-white. Beak as long as head and prothorax; narrow, cylindrical; on each side striate; striæ punctate. Antennæ inserted slightly below middle; the first funicular joint as long as the two following. Prothorax twice as wide as long, sides very feebly arcuate, at about apical third arcuately narrowing to apex; the latter moderately constricted; surface rather densely clothed with transversely directed yellowish-white scale-like hairs. Elytra wider than the prothorax; humeri obliquely rounded; surface moderately densely clothed with yellowish-white, elongate narrower scales; each interval with a row of rather sparsely placed, wider, elongate scales. Body beneath clothed with pale, oval scales; last ventral with a shallow, elongate median impression; pygidium rather convex. Anterior tibiæ narrower and straight inside. Length 3 mm.

Brownsville, Texas, one male.

The very pale color, the narrow, cylindrical, rather longer beak and the narrowly separated eyes distinguishes this from our known species. In the formation of the head and beak it resembles species of the genus *Balaninus*.

Tychius griseus, new species.

Form of *tectus*; black, moderately densely clothed with narrow, hair-like, yellowish-cinereous scales, beneath with broader white scales. Beak rather short, scarcely as long as the prothorax, of nearly equal width throughout, except at the

extreme apex; densely covered with narrow scales, near apex glabrous and rather sparsely punctate at sides. Antennæ inserted slightly below middle; 7-jointed, second funicular joint much shorter than the first and only slightly longer than the third. Prothorax slightly longer than wide; sides in basal half feebly arcuate, then gradually narrowing to apex, which is rather feebly constricted. Elytra wider than the prothorax, humeri obliquely rounded; sides gradually, arcuately narrowing to apex; apex rather broadly rounded. Length 2.5 mm.; width 1 mm.

Ithaca, New York. One specimen retained from material sent me by Mr. J. C. Bradley for determination. By the small, slender scales this species is related to *sordidus*, but is much smaller, of more elongate form and has a much shorter second funicular joint.

***Tychius suturalis*, new species.**

More broadly oval than *lineellus* but smaller, scales of upper surface ferruginous, except the sutural interval, an antescutellar spot on thorax and the underside, white. Beak thick at base, rapidly narrowing toward apex; densely covered with pale scales in about basal half, apical part smooth and shining. Head above the eyes transversely impressed. Prothorax about as wide at base as long; sides arcuately narrowing from base to apex, the latter rather feebly constricted; the coarse punctuation entirely concealed by the vestiture which consists of oval, uniform, ferruginous scales, whitish in an antescutellar spot and a small subbasal spot near each side. Elytra slightly wider than the thorax at base; broadly oval; densely clothed with elongate-oval, ferruginous scales of uniform size, those of the sutural interval and umbone whitish; striæ with a row of sparsely placed scales, of the same size as those on the intervals. Body beneath densely clothed with slightly larger, white scales, those on the legs pale-yellowish. Length 3.5 mm.

Huachuca Mts., Arizona.

The absence of elytral setæ and the 7-jointed antennal club place this species in Casey's group I; from the other species of which it differs by the short robust form, the ferruginous color of the upper surface with the sutural interval white. The elytral apices are rather separately rounded, but not as broadly as in our two species of *Sibinia*.

***Tychius pallidus*, new species.**

Form of *Sibinia ochreosa*; scales of upper surface rather larger and of uniform size, pale ochreous and white; elytral intervals with a row of short, semi-erect setæ. Head and beak moderately densely clothed with whitish scales which are narrower in front of the eyes; apical half of beak glabrous, shining. Antennæ inserted about middle; funicle 6-jointed. Thorax about twice as wide as long; sides arcuately narrowing to apex, the latter moderately constricted; surface covered rather densely with moderately large, pale ochreous scales, which become whitish at sides. Elytra scarcely one half wider than the thorax; humeri obliquely rounded; sides parallel to about apical third, thence arcuately narrowing to apex; surface densely clothed with rather large ochreous and white scales, the latter color more evident at the humeri and in a somewhat oblique fascia from the scutellum to about the middle of elytra;

intervals convex, with a row of short, semi-erect setæ. Body beneath clothed with large white scales and on each side near apex a few narrow, elongate, decumbent squamules. Length 2 mm.

Brownsville, Texas.

On each side of the prothorax are a very few narrow, elongate, decumbent scales. In some specimens the whitish scales are more numerous on the elytra than the pale ochreous scales. The apices of the elytra are separately rounded but not as broadly as in our two species of *Sibinia*.

***Tychius albidus*, new species.**

Form of *setosus*; reddish-brown, legs, beak and antennæ paler above and below, covered with rather large white scales, intermixed on the elytra with narrow, elongate recumbent scales, without erect setæ. Head and basal part of the beak densely scaly, rest of beak glabrous. Antennæ inserted at about the middle of the beak, funicle 6-jointed. Prothorax wider than long; sides almost parallel to about apical third, thence arcuately narrowing to apex, the latter constricted; surface moderately densely covered with large, rounded, white scales, intermixed with a very few narrow, elongate scales of the same color. Elytra about one-half wider than the base of thorax; humeri broadly rounded; striae as wide or almost as wide as the intervals; surface sparsely clothed with larger, rounded white scales, denser on the sutural interval and the humeral region, and narrower, elongate white scales on the intervals which are numerous at sides and apex. Body beneath more densely covered with large, oval white scales. Length 1.6 mm.

Death Valley, April, 1891, on *Prosopis juliflora*, collected by Koebele and given me by Mr. E. A. Schwarz.

It is possible that the large scales are easily lost and that in fresh or well preserved examples the scales are more numerous than in the specimen before me.

Readily distinguished from any known species of Casey's group IV by the form of the elytral scales. This as well as several of the smaller species with 6-jointed antennal funicle have the elytral apices more or less distinctly separately rounded which somewhat bridges over the difference between the genera *Sibinia* and *Tychius*. In the "Biologia" Mr. Champion includes all the Mexican species with 6-jointed antennal funicle in *Sibinia*, which seems to me a better course than the separation of *Sibinia* from *Tychius* on the form of the elytral apices.

***Eulechriops pictus*, new species.**

Rather robust, ovate, black, upper surface variegated with ochreous, white and black scales. Beak slightly curved; naked; smooth along the median line; rather densely punctate at sides. Antennæ inserted slightly above middle; second joint of

funicle about as long as the first; club small, the first as long as the remaining joints. Eyes oval, separated by about one fourth of their own width. Head densely covered with ochreous scales. Prothorax longer than wide, convex; sides broadly rounded, feebly constricted at apex; disk very coarsely and densely punctate, a small narrow smooth space at middle, continued half way to the apex as a narrow carina; surface clothed densely at base with narrowly oval scales, which extend rather sparsely to apex; near the side margins the scales are larger and white or yellowish white. Elytra wider than the thorax at base; humeri rounded; sides feebly arcuately narrowing to apex; near apex sinuate; apices conjointly rotundate-truncate; surface deeply striate, intervals flat and coarsely punctate; the basal region densely clothed with oval whitish scales, another white fascia of pale scales below middle but not as dense as the basal fascia; apex covered with ochreous scales; between the basal and submedian fascia and below the latter and apex the surface is black with a few scattered ochreous scales. Body beneath covered with oval, white scales, which are narrower and more elongate along the middle. Mesosternal excavation deep, metasternum declivous in front. Legs short; femora not sulcate and unarmed. Length 4.25 mm., width 2 mm.

Huachuca Mts., Arizona.

The genus *Eulechriops* is closely allied to *Lechriops* (*Gelus* Cas., *Piazurus* Lec.) from which it differs principally by the unarmed, non-carinate femora.

From a specimen sent him as *Copturus minutus* by Professor Wickham, Mr. Champion* placed *Zygomicros* doubtfully as a synonym of *Eulechriops*. He was apparently not certain of the correctness of the identification, probably misled by Major Casey's statement that the mesosternum in *Zygomicros* is not excavated. In *minutus* and *sobrinus* the mesosternum is distinctly excavated, the femora unarmed and not carinate, which places these two species plainly in the genus *Eulechriops*, of which *Zygomicros*, described a year later, is a synonym.

SCOLYTIDÆ.

Chramesus asperatus, new species.

Form of *icoriz*, black, tarsi and antennæ testaceous; elytra with more or less distinct rows of small, narrow scales and each interval with a row of longer, stouter, erect scales. Head in the male broadly impressed, very finely reticulate; in the female flat, feebly, transversely elevated between the antennal insertion. Prothorax wider than long; sides broadly arcuate; apex scarcely constricted; surface indistinctly reticulate, with rather large, not densely placed muricate punctures, which become strongly asperate towards the sides, each puncture bearing a moderately long, semi-erect, scale-like hair. Elytra as wide as the thorax at base; sides almost parallel; apex broadly rounded, punctate-striate; striæ scarcely impressed; intervals feebly convex. Abdomen sparsely clothed with pale hairs. Length 1.75-2 mm.; width 1-1.2 mm.

* Biol. Cent. Am., Vol. IV, pt. 5, p. 113.

Chiricahua Mts., Arizona (E. A. Schwarz).

Very closely allied to *icoriæ* but the thorax, especially in the male, is wider and more strongly asperate.

A single female from the Huachuca Mts., has the striæ more deeply impressed and the median row of punctures on each interval strongly muricate, but does not seem to differ otherwise.

Chramesus dentatus, new species.

Narrower than *icoriæ*, color black, elytra and legs brown, antennæ paler; elytral intervals with sparsely placed, rounded, pale scales, and each with a row of erect, longer scales. Head in the male broadly impressed; surface finely reticulate and clothed rather sparsely with cinereous hairs; apex of beak with a conical tubercle at middle; the female has the front rather flat, surface reticulate and sparsely punctate; from each puncture arises a scale-like hair, at middle a round, fovea-like puncture and like the male at apical margin a small, conical tubercle. Prothorax wider than long; sides broadly rounded, convergent to apex which is scarcely constricted; base as usual, bisinuate; surface reticulate, with not densely placed, rather large punctures, which are strongly muricate at sides. Elytra scarcely wider at base than the thorax; punctate-striate, striæ not deeply impressed; intervals feebly convex and sparsely punctate. Body beneath sparsely clothed with cinereous hairs which are at apical margins slightly stouter. Length 1.75 mm.; width 1 mm.

Huachuca Mts., Arizona; breeding abundantly in oak twigs girdled by *Oncideres quercus*.

An easily known species by its relatively elongate form, the conical tubercle at apex of beak and the smaller antennal club.

Chramesus subopacus, new species.

Form of *icoriæ* but much larger; color black, antennæ and tarsi testaceous; moderately densely clothed above with cinereous or yellowish-cinereous appressed scales, which are smaller and rounded on the elytra and each interval with a row of short-erect, larger scales. Head in the male rather deeply excavated; side-margins slightly below the middle of the eyes suddenly raised; shining in a subtriangular apical space; above this the surface subopaque and finely reticulate-punctate; in the female the head is somewhat convex, finely reticulate and sparsely punctate, dull; apical and side margins distinctly beaded. Prothorax wider than long; sides rounded; base much wider than apex; the latter scarcely constricted; disk not densely punctate, at sides a few asperities. Elytra as wide as the prothorax; basal margin strongly carinate; sides nearly parallel; apex broadly rounded, punctate-striate; striæ feebly impressed, punctures moderate; intervals moderately wide and nearly flat; the row of median punctures from which the erect setæ arise, the three or four near suture very strongly muricate in the female. Underside sparsely clothed with cinereous hairs, apical margin fringed with a row of pale setæ. Length 2.25 mm.; width 1.5 mm.

Huachuca Mts., Arizona.

The description of the Central American *tumidulus* fits this species

rather closely, but the differences given in the remarks following the description in comparing it with *icoriæ* do not agree very well with the above described species.

The female is rather dull while the male is more shining. The vestiture of the prothorax is not uniform, some of the scales are longer and there are here and there a few very narrow, hair-like scales.

***Phlæotribus texanus*, new species.**

Similar to *frontalis* but of slightly shorter form and darker color; thorax more deeply punctate and more coarsely asperate in front and at sides; punctures of the elytral striæ rather larger; the tubercles on the intervals smaller and more widely spaced with the setæ arising from or near these tubercles shorter and slightly stouter, the front of the head in the male more deeply impressed, with the sides from the eye to the small acute tubercle distinctly elevated. The female has at middle of the faint crescentic elevation of the front a small fovea-like puncture. Length 2 mm.; width 1 mm.

Brownsville, Texas.

A NEW ORCHELIMUM FROM STATEN ISLAND AND NEW JERSEY.

BY WM. T. DAVIS,

NEW BRIGHTON, N. Y.

Several years ago a specimen of *Orchelimum* with quite a straight ovipositor was found on Staten Island. In September, 1907, the same species was collected in considerable numbers on the salt meadows at Tuckerton, N. J., and Mr. Lewis B. Woodruff has shown me an example from Rockaway, Long Island, N. Y.

In having a somewhat straight ovipositor the insect resembles *delicatum* Bruner and *gladiator* Bruner from the Middle West, and *fidicinium* Rehn and Hebard from northern Florida. The sub-genital plate does not reach the tips of the cerci as in *delicatum*, and according to Mr. Blatchley, who has kindly compared it with authentic *gladiator*, it is much more slender in body, tegmina and legs than that species. In the two species mentioned and in *fidicinium* the hind femora are said to be without spines, whereas in the present species each hind femur usually has from one to three spines. Two males in thirteen examples are without spines. The females are more often without them.

The present species, though approaching the buff or tawny olive-colored *fidicinium* from Florida, differs from that species in color and in having slim femora usually armed with spines beneath.

Orchelimum cruscolum, new species. A medium-sized, slender species, grass-green in color throughout, save the usual markings upon the occiput and disk of the pronotum, which are brown and less distinct in the female. In dried specimens the stridulating apparatus is sometimes slightly darkened, and the hind tibiae and tarsi are usually straw-colored. The hind femora are very slim and less inflated at the base than usual. The tegmina exceed the hind femora by about 3 mm., and these in turn are slightly exceeded by the wings.

Measurements. — Length of the body, male, 17 mm.; female, 17-18 mm.; of pronotum, male and female, 3.5 mm.; of tegmina, male, 17 mm., female 21 mm.; of hind femora, male, 14 mm., female, 15 mm.; of ovipositor, 11 mm.

Mr. Caudell has kindly compared a male and female of *cruscolum* with material in the collection of the National Museum, and finds them unlike any species there represented.

HEMIPTERA HETEROPTERA OF WESTCHESTER COUNTY, N. Y.

J. R. DE LA TORRE BUENO,

WHITE PLAINS, N. Y.

In presenting to my fellow-entomologists this partial list of Hemiptera, I make no apologies. Elsewhere the value of faunal lists has been dwelt upon, and I need not repeat myself here. All lists (provided they be accurate and fairly representative) are helps to the proper knowledge of a fauna, and especially useful are those that refer to regions where collecting has been utterly neglected, or where intensive collecting has been done for some definite period.

As far as Hemipterous records go, Westchester county is as unknown as an uncharted island and might as well be a bare desert. It is my present aim to make good this deficiency, even though it be only partially. This list represents only two summers' collecting, devoted mainly to waterbugs.

If any there be who deem trivial such work as this, let such do constructive work before sitting in judgment. Let our New York entomologists devote themselves to their own State instead of endlessly camping on grounds already minutely and thoroughly explored.

The arrangement of the families and higher groups is according to Kirkaldy, with some modifications of my own in the aquatic forms. For reasons into which I need not enter in detail at the moment (although I may say they are based on breeding experiments and observations on nymphal stages, habits, etc.) I disagree with the prevailing fashion of putting *Hydrometra* Latreille, and *Mesovelis* M. & R. in the Gerridæ *sens. lat.* To me these two genera are distinctly more closely allied, the former to the Reduviidæ and the latter to the Nabidæ than to the Gerridæ, and I consider that they are certainly entitled to family rank. They *may* form a passage from the one to the other, but on the other hand, the differences between them are so great that it is scarcely possible they do, for they apparently are isolated tips of twigs in the great Reduvioid family tree. A paper on *Mesovelis* and its structure is in preparation by Kirkaldy, and after its appearance it is my purpose to go into the matter more at length.

It will be noted that the great family Miridæ (Capsidæ) is omitted. This is due to the fact that I do not collect this group at all, except for my friends, and to them I leave the task. Other comments and notes will be made in their proper places. The family names employed, with a few exceptions, are those rendered familiar by long usage, or those accepted by the more eminent of our latter-day Hemipterists. This is not to be interpreted as implying disagreement *in toto* with Kirkaldy's views in regard to synonymy, because the only reason for it is a reluctance to introduce into a faunal list any matter in controversy.

Superfamily PENTATOMOIDEA.

(CIMICOIDEA Kirkaldy.)

Family PENTATOMIDÆ.

CIMICIDÆ Kirkaldy.

Subfamily I. ASOPINÆ Schout.¹

Tribe *Asoparia* Schout.

Genus *Mineus* Stål.

1. *M. strigipes* H. S.

White Plains, Sept. 7 and 13. A recently transformed adult and a nymph (which later gave an adult) were taken on the earlier date. It is figured by Schouteden (op. c. pl. 4, fig. 10).

¹ In this subfamily the arrangement is according to Schouteden (Gen. Ins., No. 52).

Genus *Apateticus* Dallas.*(Podisus auct.)*2. *A. (Apæcilus) cynicus* Say.

White Plains, Aug. 31. Swept in a swampy meadow from grasses.

3. *A. (Apæcilus) bracteatus* Fitch.

White Plains, Sept. 19. Also swept from grasses in a hollow in an open lot. This is apparently the first actual record from this state since Fitch described the bug in 1852.

4. *A. (Eupodisus) maculiventris* Say.

White Plains, through summer. Kensico Lake, May 27, Scarsdale, Aug. 16. This is the most common form hereabouts. Occurs throughout the summer in grasses.

5. *A. (Eupodisus) modestus* Dallas.

Scarsdale, Aug. 5 ; Sept. 5. Swept in the woods from bushes, etc.

Subfamily PENTATOMINÆ.

Genus *Nezara*.6. *N. hilaris* Say.

White Plains, Aug. 31. Nymph in last instar ; Sept. 7, 14 and 28. Scarsdale, Sept. 5, on golden-rod.

Genus *Cænus* Dallas.7. *C. delius* Say.

White Plains, common in summer in meadows. Scarsdale, Sept. 5.

Genus *Euschistus* Dallas.8. *E. variolarius* Pal. Beauv.

Common about White Plains at all times. Scarsdale, Aug. 15.

9. *E. tristigmus* Say.

Another common form in damp and marshy spots in White Plains. Scarsdale, Aug. 15 and Sept. 5.

10. *E. fissilis* Uhler.

White Plains from spring to autumn, in fields, usually in company with *E. variolarius*. Scarsdale, Aug. 15.

Genus *Mormidea* A. & S.11. *M. lugens* Fabr.

Common about White Plains in summer. Scarsdale, Aug. 15.

Genus *Trichopepla* Stål.12. *T. semivittata* Say.

White Plains, common in grasses through summer. Valhalla, May 27.

Genus *Peribalus* Muls. & Rey.13. *P. limbolarius* Stål.

White Plains, abundant on shepherds' purse (*Capsella bursapastoris* Moench) in July, August and September; nymphs in August.

Genus *Brochymena* A. & S.14. *B. quadripustulata* Fabr.

White Plains, April 14, torpid under bark of fallen apple-tree. Sept. 1, nymph.

Subfamily CYDNINÆ.

Genus *Sehirus* A. & S.15. *S. cinctus* Pal. Beauv.

Tarrytown, July 20 and 23.

Subfamily GRAPHOSOMINÆ.

Genus *Amaurochrous* Stål.

(= *Podops olim*, for North American species only.)

16. *A. cinctipes* Say.

White Plains, Sept. 13.

Subfamily SCUTELLERINÆ.

Genus *Eurygaster* Lap de Cast.17. *E. alternatus* Say.

White Plains, July and August, along the edges of a swampy meadow. A just-transformed adult on July 18.

Subfamily THYREOCORINÆ.

(*Corimelaninæ olim*.)

Genus *Thyreocoris* Schrank.

(= *Corimelæna auct.*)

18. *T. unicolor* Pal. Beauv.

White Plains, throughout summer. Scarsdale, Aug. 15.

19. *T. pulicaria*.

Common all summer in White Plains. Scarsdale, Aug. 15.

Family ARADIDÆ.

Subfamily MEZIRINÆ.

(= *Brachyrhynchinæ* auct.)Genus *Aneurus* Curtis.20. *A. fiskei* Heid.

White Plains, January, February and March; September and November, adults, nymphs in various stages and ova, at almost any season. Occurs under bark of dead hardwood trees (oaks, hickory, etc.), preferably saplings and smaller branches. Rye Lake, Sept. 7.

21. *A. inconstans* Uhler.

White Plains; very common under bark of dead hardwood trees. Rye Lake, Sept. 7.

Genus *Neuroctenus* Fieb.22. *N. simplex* Uhler.

White Plains, Aug. 24. Crawling about on twigs of fallen oak.

Subfamily ARADINÆ.

Genus *Aradus* Fabr.23. *A. robustus* Uhler.

White Plains, Aug. 29, nymph in last instar, under stone.

Family COREIDÆ.

Subfamily MICTINÆ.

Genus *Archimerus* Burm.24. *A. calcarator* Fabr.

White Plains, July 22, Sept. 14 and 28, Oct. 5, adults; Aug. 31 and Sept. 28, nymphs. Rye Lake, Sept. 7.

Genus *Acanthocerus* Pal. Beauv.25. *A. galeator* Fabr.

White Plains, July 13, Sept. 14 and 28, adults; Aug. 31 and Sept. 5, nymphs.

Subfamily ACANTHOCEPHALINÆ.

Genus *Acanthocephala* Lap. de Castel.26. *A. terminalis* Dallas.

White Plains, July 29, two nymphs which later transformed to adults; Scarsdale, Sept. 5.

Subfamily CENTROSCELINÆ.

Genus *Anasa* A. & S.27. *A. tristis* de G.

White Plains, Aug. 30, Sept. 15.

Subfamily MICRELYTRINÆ.

Genus *Protenor* Stål.28. *P. belfragei* Hagl.

White Plains, July 22 and 27, Aug. 31, Sept. 14, Oct. 5.
Locally abundant.

Subfamily ALYDINÆ.

Genus *Megalotomus* Fieb.29. *M. quinquespinosus* Say.

White Plains, July 27. Rye Lake, Sept. 7. This form I have met here very rarely indeed; but it is not very abundant anywhere.

Genus *Alydus* Fabr.30. *A. eurinus* Say.31. *A. pilosulus* H. & S.

These are two very common forms in Westchester Co., and are to be found during July, August and September in clover bunches in fields. Scarsdale and White Plains.

Subfamily CORIZINÆ.

Genus *Harmostes* Burm.32. *H. reflexulus* Say.

White Plains, July 7, Aug. 30, Sept. 15 and 19, and Oct. 5.
Scarsdale, Aug. 5.

Genus *Corizus* Fall.33. *C. lateralis* Say.

White Plains, July 4 and 22, and Sept. 5 and 7. Scarsdale, Aug. 5.

Subfamily BERYTINÆ.

Genus *Jalysus* Stål.34. *J. spinosus* Say.

White Plains, July 28, Aug. 24, Sept. 7. Scarsdale, Aug. 5 and 15, Sept. 5. Rye Lake, Sept. 7.

Family LYGÆIDÆ.

Subfamily LYGÆINÆ.

Genus Nysius Dallas.

35. *N. angustatus* Uhl.

White Plains, July 27, Sept. 13 and 16, Oct. 18 and 24. On the two latter dates taken about the roots of grasses.

36. *N. minutus* Uhl.

White Plains, Aug., Sept. 13 and 16, Oct. 3 and 18.

37. *N. jamaicensis* Dallas.

White Plains, July, September and October.

Genus Kleidocerus Westw.

(= *Ischnorhynchus auct.*)

38. *K. resedæ* Panz. (= *didymus* Zett.)

White Plains, July and September. Taken abundantly in sweet birch, both adults and nymphs. At other times swept.

Genus Cymus Hahn.

39. *C. luridus* Stål.

White Plains, July and August.

Genus Cymodema.

40. *C. tabida* Spin.

White Plains, July 16, Aug. 3.

Subfamily BLISSINÆ.

Genus Ischnodemus Fieb.

41. *I. falicus* Say.

Kensico (Valhalla), May 27 ; White Plains Oct. 5. At Kensico it was swept in numbers from the low grasses growing on the damp little beaches of the lake.

Genus Blissus Klug.

42. *B. leucopterus* Say.

White Plains, July 25, 28 and 31. Aug. 3 and 30 ; Sept. 19. This was swept from low grasses in a lawn and in a meadow. Nymphs occurred under stones and planks, as late as October. A recently transformed adult was bright red, except the black-spotted, milky-white wings.

Subfamily GEOCORINÆ.

Genus *Geocoris* Fallén.43. *G. bullatus* Say.

White Plains, Sept. 5, Oct. 3, 11, 18 and 24, in company with the following.

44. *G. discopterus* Stål.

White Plains through October, on a dry sandy spot, running over the earth, or at the roots of grasses. Most abundant species.

45. *G. ater* Fabr. (= *uliginosus* Say = *fuliginosus* auct.)

White Plains, Oct. 17. Scarsdale, Aug. 5. Rare.

46. *G. piceus* Say.

White Plains, Sept. 7, 19, Oct. 3, 11, 17 and 25. Taken by sweeping in fields, in patches of five-finger (*Potentilla Canadensis*) and under boards.

Subfamily PACHYGRONTHINÆ.

Genus *Phlegyas* Stål.

(= *Peliopelta* Uhl.)

47. *P. annulicrus* Stål. (= *abbreviata* Uhl.)

White Plains, common on bushes and grasses. Nymphs in last instar taken July 27.

Genus *Ædancala* A. & S.48. *Æ. dorsalis* Say.

White Plains, July 29. A single specimen.

Subfamily OXYCARENINÆ.

Genus *Crophius* Stål.49. *C. disconotus* Say.

White Plains, Oct. 5.

Subfamily APHANINÆ.

Genus *Ligyrocoris* Stål.50. *L. silvestris* Stål.

White Plains, June, July and August.

51. *L. constrictus* Say.

White Plains, June, July and August. Both are common.

Genus *Perigenes* Distant.52. *P. fallax* Heid.

White Plains, Sept. 5, 7 and 15. This is not rare in grasses.

Genus *Myodocha* Latr.53. *M. serripes* Olivier.

White Plains. At all seasons. In March more or less torpid under stones; in the summer months taken in similar situations and at electric lights. The nymphs are found with the adults in such places, some as late as the middle of October. Scarsdale, Aug. 29.

Genus *Heræus* Stål.54. *H. plebejus* Stål.

White Plains, July 17. At electric light in company with the preceding.

Genus *Orthœa* Dallas.

(= *Pamera* Say.)

55. *O. basalis* Say.

White Plains, July 22, Aug. 4, Sept. 7, Oct. 5. Scarsdale, Sept. 5.

Genus *Rhyparochromus* Curt.56. *R. unus* Say.

White Plains, Sept. 7 and 14.

Genus *Emblethis* Fieb.57. *E. sp.*

White Plains, Oct. 3 and 18. Found under stones and creeping about the roots of grasses in a sandy, weedy spot, very dry. I have several other unidentified species in this family.

Family TINGIDÆ.

Subfamily PIESMINÆ.

Genus *Piesma* Lep. & Serv.58. *P. cinerea* Say.

White Plains, March 3, May 3 and 10, Oct. 17. In the early spring found under the bark of button-ball in company with *Corythuca ciliata*.

Subfamily TINGIDINÆ.

Genus *Melanorhopala* Stål.

(= *Cantacader* Ashm. ; nec A. & S.¹)

59. *M. clavata* Stål. (= *Cantacader henshawii* Ashm. teste Dr. G. Horvath.)[†]

White Plains, July 18, 22 and 28, Aug. 3 and 30. This has been taken mainly by sweeping in rank weedy places near damp

[†]My attention was called to the synonymy of this genus and species by Dr. Horvath, who saw the types.

swampy meadows. There are several degrees of wing-development, but I have taken only fully winged individuals.

Genus *Corythuca* Stål.

60. *C. ciliata* Say.

White Plains. Very abundant through the year on sycamore (*Platanus occidentalis*), in the summer on the under-side of the leaves, in all stages, and in winter hibernating under the loose bark.

61. *C. arcuata* Say.

White Plains, August, Sept. 26 and Oct. 11. Scarsdale, Aug. 5. Beaten from oaks.

62. *C. pergandei* Heid.

Van Cortlandt Pk. (in New York City) in August.

63. *C. gossypii* Fab.

White Plains, quite common and abundant on honey-balls.

Superfamily *NEPOIDEA* Kirk.

Family NABIDÆ.

Genus *Pagasa* Stål.

64. *P. fusca* Stein.

White Plains, Aug. 23 (nymph) and 30 and Oct. 18. Found under stones.

Genus *Reduviolus* Kirby.

65. *R. subcoleoptratus* Kirby.

White Plains, May 31 and June 26 (nymphs); July 11, 19 and 25; Aug. 25 (winged adult).

Family MESOVELIIDÆ.

Genus *Mesovelis* M. & R.

66. *M. bisignata* Uhl. (= *mulsanti* Champ. et auct.)

White Plains, common on duckweed or matted hydrodictyon or other algæ floating on the surface of ponds. Kensico L. (Valhalla) May 27. I have restored Uhler's name to our form, because after several fiascos, I have come to disbelieve in the identity of American forms with European or Oriental. Until I have the opportunity to make a critical comparison between the two species, I shall continue to consider ours distinct.

Family GERRIDÆ.

Subfamily VELIINÆ.

Genus *Rhagovelia* Mayr.67. *R. obesa* Uhl.

White Plains. Common in streams especially such as have a surfit current, from early spring to late fall.

68. *R. americana* Uhl.

White Plains. Common all the year except in winter, in springs, ponds, streams, running along the banks or clinging to rocks. Hibernates as adult. Scarsdale, Sept. 5. Portchester, Aug. 8. Found a large number of winged adults in a roadside horse-trough, fed by water from a spring.

69. *R. capitata* Guér.

White Plains, May 30.

70. *R. sp.* (= *pulchella* auct. for N. Am. form.)

White Plains. This is the commonest species in the eastern United States, and its white-flecked, dark-slate body is seen in every pond.

Subfamily GERRINÆ.

Genus *Gerris* Fabr.71. *G. remigis* Say.

White Plains, as early as March 21, and as late as Oct. 28. Scarsdale, Sept. 5. Portchester, in trough, Aug. 8. This is the commonest form in the East, and is found in streams (sometimes in ponds, but rarely) from early spring to late fall.

72. *G. conformis* Uhl.

White Plains, June 6 and 22; July 16 and 19; Sept. 1. This species is very rare in the north, but further south, in the Carolinas, appears to be nearly as common as *remigis* is with us.

73. *G. marginatus* Say.

White Plains. Common in ponds through the warmer portion of the year.

74. *G. canaliculatus* Say.

White Plains, July 16 and 19. This is a rare form.

75. *G. rufoscutellatus* Latr.

White Plains, July 16.

Genus *Trepobates* Uhler.**76. *T. pictus* H. S.**

White Plains. Very abundant all through the summer on St. Mary's L., where I secured three fully winged adults. Other adults with wings broken off by themselves were secured on Todd's Pond.

Genus *Rheumatobates* Berger.**77. *Rh. rileyi* Bergr.**

White Plains, in company with *Trepobates*, and quite as abundant.

Family HYDROMETRIDÆ.**Genus *Hydrometra* Latr.****78. *H. martini* Kirk.**

White Plains, May 30, June 21, July 22 and 28, Aug. 10.

Family NÆOGEIDÆ.

(= *Hebridæ* auct.)

Genus *Næogeus* Lap.**79. *N. concinnus* Uhl.**

White Plains, June 1, 15, 22 and 30. This was quite common on the muddy bottom of a dried up temporary pool, creeping leisurely about.

Family REDUVIIDÆ.**Subfamily EMESINÆ.****Genus *Emesa* Fabr.****80. *E. longipes* de G.**

White Plains, Sept. 5, 7 and 14. Scarsdale, Sept. 5. Kensico (Valhalla), May 27 (nymph). Found in shrubbery along the edges of fields.

Genus *Barce* Stål.**81. *B. annulipes* Stål.**

White Plains, Oct. 10. Under a stone.

82. *B. simplicipes* Uhl.

White Plains, Oct. 25. Under a log.

Subfamily SAICINÆ.**Genus *Oncerotrachelus* Stål.****83. *O. acuminatus* Say.**

White Plains, latter part of September. Flew into a house, at night, to light.

Subfamily STENOPODINÆ.

Genus *Stenopoda* Lap. & de Cast.84. *S. culicis* Fabr.

White Plains, July 2. Flew into the house at night and lighted on a piece of music on the piano rack.

Subfamily PIRATINÆ.

Genus *Melanolestes* Stål.85. *M. picipes* H. S.

White Plains, Oct. 10. Nymph in last instar, which later changed to adult in a little glass jar in the house. This nymph was noted under the same stone for over a week.

86. *M. abdominalis* H. S.

White Plains, Aug. 30 and Sept. 7 and 20. Both taken under stones in the last nymphal instar. The first was taken home as soon as found, and kept in a small covered glass dish, but died before transforming. The second was noted for about two weeks under the same stone in a field, and was at last brought home in the hope that it would transform. It was kept in the small glass dish, and with it were put a couple of pill-bugs, which did not long survive. One or two others had the same fate, and finally the bug made the last moult successfully. It should be noted that the spongy portion of the anterior tibiæ appears to be adhesive.

Subfamily HARPACTORINÆ.

Genus *Zelus* Fabr.87. *Z. (Pindus) socius* Uhl.

White Plains, July 27.

Genus *Sinea* A. & S.88. *S. diadema* Fabr.

White Plains, Aug. 4. Swept in patches of clover in a field. I have elsewhere taken this bug in similar places.

Family NEPIDÆ.

Genus *Ranatra* Fabr.89. *R. quadridentata* Stål.

This is the only species thus far found and is locally abundant.

Family MACROCEPHALIDÆ Kirk.

(= *Phymatidæ* auct.)Genus *Phymata* Latr.90. *P. erosa* Linné.

Scarsdale, Sept. 5.

Superfamily MIROIDEA.

Family ANTHOCORIDÆ.

Genus *Piezostethus* Fieb.91. *P. sordidus* Rent.

White Plains, Aug. 22 and 24. Under bark of dead trees.

Genus *Triphleps* Fieb.92. *T. insidiosus* Say.

White Plains, through the summer and fall on flowers, especially daisy-heads. Scarsdale, Aug. 15.

Family CLINOCORIDÆ.

(= *Cimicidæ* olim, = *Acanthiidæ* olim.)Genus *Clinocoris* Fall.(= *Cimex* auct. nec Linné; = *Acanthia* auct. nec Fabr.)93. *C. lectularius* Linné.White Plains is *not* one of those happy places where this blood-thirsty midnight prowler is unknown.

Superfamily NOTONECTOIDEA.

Family ACANTHIIDÆ.

Genus *Acanthia* Fabr.94. *A. confluenta* Say.

White Plains, June 20 and 21, July 11, Sept. 21. Generally found on granite rocks, with the mottled black and white color of which it harmonizes.

95. *A. humilis* Say.

White Plains, common on moist places on the banks of streams, ponds, etc. Kensico (Valhalla), May 27; Tarrytown, July 23. Found here by sweeping the rushes on a damp flat near the railroad track.

Family OCHTERIDÆ.

Genus *Ochterus* Latr.(= *Pelagonus olim.*)96. *O. americanus* Uhl.

White Plains, July 16 and September 1.

Family NAUCORIDÆ.

Subfamily NAUCORINÆ.

Genus *Pelocoris* Stål97. *P. femoratus* Pal. Beauv.

White Plains, Aug. 24. Nymphs only. I have seen no adults and it does not appear to be common hereabouts.

Family BELOSTOMATIDÆ.

Genus *Benacus* Stål.98. *B. griseus* Say.

White Plains, May 18, at electric light.

Genus *Lethocerus* Mayr.(= *Amorgius* Stål = *Belostoma auct. nec* Latr.)99. *L. americanus* Leidy.

White Plains, May 14, at electric light; June 1, taken dredging in a ditch; July 23, also taken by dredging, a just transformed adult.

100. *L. obscurus* Duf.

White Plains, April 29, May 14 and 18, September; all at electric light. This appears to be the common species here.

Genus *Belostoma* Latr.(= *Zaitha auct.*)101. *B. flumineum* Say.

White Plains, common in ponds at all times.

Family NOTONECTIDÆ.

Subfamily NOTONECTINÆ.

Genus *Notonecta* Linné.102. *N. insulata* Kirby.

White Plains. Quite abundant in spring and late summer in deep, cool pools.

103. *N. irrorata* Uhl.

Common in suitable situations about White Plains, in spring and late summer.

104. *N. undulata* Say.

Common in suitable situations throughout the year, about White Plains.

105. *N. variabilis* Fieb.

White Plains. Kensico (Valhalla), May 27.

Genus *Buenoa* Kirk.

(= *Anisops*, in part, for American forms.)

106. *B. platycnemis* Fieb.

White Plains, July 11.

107. *B. elegans* Fieb.

White Plains, Aug. 29.

108. *B. margaritacea* **nom. nov.** (= *platycnemis*, Uhl., Bueno,¹ et auct. nec Fieber.)

White Plains, July 11. Very abundant and common, in company with *elegans*.

The family Corixidæ is still in too chaotic a condition to make it advisable to list. It would only be adding to a sufficiently confused situation to record what may or may not be the species for the sake of swelling a list.

It should be noted that in addition to the species enumerated in the foregoing there are quite a few still not identified to my satisfaction, and hence not included.

¹ Journ. N. Y. Ent. Soc., X, 236.

JOURNAL
OF THE
New York Entomological Society.

EDITED BY WILLIAM MORTON WHEELER.

Published articles relating to any class of the subkingdom Anthropoda, subject to the acceptance of the Publication Committee. Original communications in this field are solicited.

PROCEEDINGS OF THE NEW YORK ENTOMOLOGICAL SOCIETY.

MEETING OF MARCH 3, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with fourteen members and three visitors present.

The proceedings of the two preceding meetings were read and approved.

The Treasurer, Mr. Davis, made the following report :

Journal's account.....	\$188.70 bal.
Society's account.....	998.04 bal.
	<hr/>
	\$1,186.80 total bal.

The Librarian, Mr. Schaeffer, reported the receipt of the following exchanges :

Canadian Entomologist, XL, No. 2.

Verhandl. d. k. k. zool. bot. Gesellschaft. in Wien, LVII, No. 10.

Mittheil. aus. d. Naturhist. Museum Hamburg. XXIV, 1907.

Deutsche Entomologische Zeitschrift, No. 1, 1908.

Wiener Entomologische Zeitung, XXVII, Nos. 2 and 3.

Zeitschrift f. wissenschaftliche Insektenbiologie, III, Nos. 10, 11 and 12.

The Ants of Porto Rico and the Virgin Islands, etc., by Prof. Wm. M. Wheeler.

Brooklyn Institute Museum Science Bull., Vol. 1, No. 12.

Bulletin de la Société Imperiale des Naturalistes de Moscow, Nos. 3 and 4, 1906.

Professor Wheeler read the following report :

"At a meeting of the New York Entomological Society held at the American Museum of Natural History, Feb. 4, 1908, a committee of three was appointed to draft resolutions expressing the deep regret felt by the members of the Society at the loss of President Morris K. Jesup.

"*Be it resolved*, therefore, that the Secretary of the New York Entomological

Society be instructed to spread on the minutes and communicate to the Board of Trustees of the American Museum of Natural History and to Mr. Morris K. Jesup's family, the sincere regret which the Society feels on losing one who manifested such broad and unfailing interest in all matters pertaining to natural history and the natural sciences in general."

E. B. SOUTHWICK,
W. M. WHEELER,
RAYMOND C. OSBORN,
Committee.

On motion the report was accepted.

Mr. Dickerson announced that the Newark Society had planned an outing at Great Piece Meadows, N. J., on Decoration Day, and invited the New York members to coöperate.

Mr. Engelhardt spoke on albinism and melanism among insects, illustrating the subject with an interesting series of specimens. His remarks were in substance as follows:

Albinism is due to the absence of pigment. The term "albino" was first applied by the Portugese to the white negroes of west Africa; it is now applied to any individual in whom there is deficiency of pigment in the skin, hair or eyes. The absence of pigment is normal in the polar bear, the northern white owl, etc. The seasonal change of color in such animals as the white fox and ptarmigans is due to cold and brought about by the formation of numerous air bubbles which tend to conceal the pigment, the latter being rarely entirely absent in the hair or feathers. It is doubtful whether albinism occurs among insects, unless cave insects and other subterranean forms may be designated as such. Among Lepidoptera a number of white varieties are recognized. Melanism is due to the excess of pigment and occurs among insects, fishes, reptiles, birds and mammals. Moisture is given as a primary cause of its appearance but many facts are still wrapped in doubt. The hot and moist atmosphere of the tropics and the cool damp climate of mountain regions and polar lands both cause melanism. The black leopard of southern Asia is only a melanotic variety of the common leopard. Butterflies and moths inhabiting mountain regions of high altitude are usually darker than individuals of the same species living in the drier and warmer lowlands.

The following specimens were exhibited: *Colias philodice* ♀♀ of normal form and albin c variety. *Colias philodice* ♂♂ of normal form and melanotic variety. The latter were exceptionally fine examples, entirely suffused with black, captured at Bethlehem, Pa., in August, 1907. *Argynnis myrina* ♂♂, normal and melanotic forms, the latter taken at Overbrook, N. J., May 30, 1907. *Papilio glaucus* and var. *turnus* ♀♀; the black form with upper wings entirely black and orange spots on lower wings absent. *Sabulodes transversata* ♀♀, normal and melanotic forms. *Cicindela partruelis* and *C. consentanea*, *Cicindela rugifrons* and *C. modesta*. *Dicthyophorus micropterus*; red form from Florida and black form from Texas. *Melitæa rubicunda* ♂♂, normal form and aberration with yellow spots entirely absent. *Melitæa maglashani* ♂♂, normal form and aberration with red spots entirely absent. *Colias behrii* ♂, illustrating typical mountain species.

In the discussion which followed the reading of Mr. Engelhardt's paper, Mr. Schaeffer stated that the white color of the *Colias* var. was due not to absence of pigment, but to the abundance of white coloring matter present.

Professor Wheeler stated that among ants the subterranean forms lacked pigment owing to the absence of light action, and doubted if there was any such thing as true albinism among insects.

Mr. Joutel affirmed that he had found what he took to be true cases of albinism in the white patches about the eye spots on the wings of certain Bombycine moths. He also stated that he could effect a difference in the color of the adult by feeding their caterpillars in the dark. Both Mr. Engelhardt and Mr. Dall supported this by evidence which they had seen.

Mr. Dow's remarks, "A Little Inquiry into Nomenclature," dealt mainly with the names of insects as Linnæus found them when he decided upon the binominal names now used. He and Latreille some years later depended largely for this system on the posthumous work of John Ray, 1724, in which insects are divided into three classes; those with complete, partial and no metamorphosis being the divisions used. Lobsters were therefore put in the second class. Ray applied no names. Scholarship in that age being almost wholly classical, Linnæus adopted every name he could find in Greek and Latin literature. Hebrew writings allude to only nine insects. Pliny's Natural History was used almost completely, but less than a dozen of Pliny's names were Latin, the rest being formed from the Greek. That literature supplied over 300, largely from Aristotle. Hence it happens that the present generic names are derived from Greek almost exclusively. Specific names are Latinized because Latin was the language in common use among scholars. De Geer, 1740, wrote of a *Podura atra*, *aquatica*, etc. Linnæus, 1755, immediately took the first adjective as the specific name. The first distinction between scientific and common names occurred after his death. Identification of insects mentioned by classic Greek authors discloses more blunders than correct conclusions.

Scarabæus. This name is over 6,000 years old. Its sound influenced Carabus, which by root is Keras + bous, *i. e.*, a beetle with ox-horn shaped mandibles, probably *Scarites*.

Cerambyx, a beetle with cup-shaped antennæ, or mandibles, probably a lamellicorn.

Psyche was the only Greek name for butterflies, although their metamorphosis was known for thousands of years. Psyche was symbolical of the soul and was so used.

Phalæna was the only Greek word for moth. It was mythological, a monster which arose from the sea and devastated whole provinces. As a moth it meant the destroyer, *i. e.*, the cutworms, noctuids. The term was used by Walker, in 1856, to cover most of the moths and was applied even later to the Arctiids.

Papilio, found only in Ovid and Pliny, means butterfly and flying moth; literally a tent flap, from the method of folding the wings when at rest. This and *Curculio* are evidently Greek words, although they do not occur in extant Greek writings. *Curculio* is first found in Plautus, an early comedian, who borrowed everything from Greece. It was applied then as now to a grain-eating weevil.

Sphex Greek, *Vespa* Latin, *wasp* English, have the same root, the only entomological name common to the Aryan people, hence one of the oldest of all names.

Latreille to differentiate a genus invented *Polistes*, literally a builder of cities, to apply to the paper-making wasps.

Argynnis, as it now appears, is a misprint. Fabricius wrote *Argyreus* and failed to write legibly or read proof.

Arctia was the she bear, as the children called the caterpillars "wooly bears," then as now.

Lycæna was the she wolf, because the children called the caterpillars "were wolves."

Ichneumon in Egyptian and Greek, the rodent, which ate the eggs of the sacred crocodiles, was applied by Linnæus to the egg parasites—now cuckoo-bees. It is, of course, misapplied to the present superfamily.

Mr. Leng called attention to a paper by C. J. Gahan (Annals and Magazine of Nat. Hist., ser. 8, Vol. I, Feb., 1908) in which the following new names are proposed for North American longicorns, viz :

Cyllene caryæ Gahan for *C. picta* of our lists.

Obrium rufulum (Dej. Cat.) Gahan for *O. rubrum* of our list.

Typocerus zebra Oliv. for *T. zebratus* of our list.

In reference to the first change proposed, Mr. Gahan points out that the figure, description and food plant given by Drury are clearly identical with our *C. robinia*, the locust tree borer. The hickory tree borer is therefore without a name. Mr. Gahan also points out the great difference in the punctuation of the ♂ pronotum of the two species. In denuded specimens this character is easily seen.

In reference to the second change, Mr. Gahan states that *Obrium rubrum* Newm. is a synonym of *Batyle suturalis*, so that a name is required for the insect we have for many years identified as *rubrum*.

In connection with the third change proposed it may be recalled that we have already substituted Förster's name *nitens* for the *Leptura* previously known as *zebra*.

Mr. Leng also called attention to papers by Dr. Walter Horn (Stett., Ent. Zeit., 1907, p. 329) referring to the synonymy of *Cicindela tortuosa* of our lists, which, according to the German authors, should read *Cicindela trifasciata* Fab. subsp. *ascendens* Lec. and *Cicindela trifasciata* Fab. subsp. *sigmoidea* Lec.; the latter being the Californian variety. In another paper (D. E. Z., 1907, p. 22) Dr. Horn refers to *C. scutellaris* Say and its varieties. In a previous paper Dr. Horn had cited *obscura* Fab. as having priority, but that name being preoccupied, he restores Say's name. He mentions aber. *oberleitneri* Gess'l var. *rugifrons* which is usually green. This name has never been used in our lists and it represents a form that is barely separable. He also proposes to substitute *modesta* for *lecontei* Hald. because Dejean first described *modesta* as "d'un brun obscur un peu broncé," to which Mr. Leng thought some exception might be taken.

Society adjourned.

MEETING OF MARCH 17, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with twelve members and twelve visitors present.

On motion of Mr. Davis the by-laws were suspended in order to have the lecture open before the business session.

Professor Wheeler delivered his interesting lecture upon "Desert Ants," illustrated by many handsome colored slides.

Mr. Davis announced that as in obedience to the Society's order, he had purchased five new Globe-Wernicke book-cases, which would shortly be delivered.

Mr. Dow, chairman of the Field Committee, announced that the Society would take its first excursion of the season to Garrett Rock, near Paterson, N. J., on May 3.

The Librarian, Mr. Schaeffer, stated that he had the opportunity to exchange ten volumes of the Journal for the "Biologia" parts containing the Longicornia. He was authorized to make the exchange. The Librarian reported the receipt of the following exchanges:

Canadian Entomologist, Vol. XL, No. 3.

Report of the Entomological Department N. J. Agric. College Exp. Sta. for 1907.

Zoölogical Record, Insecta, Vol. XLIII, 1906.

Society adjourned.

MEETING OF APRIL 7, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with sixteen members and three visitors present.

The minutes of the preceding meeting were read and approved.

The Librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Verhandl. d. k. k. Zool. Bot. Gesellschaft in Wien, Vol. LVIII, No. 1.

Proc. Amer. Philos. Soc., Vol. XLVI, No. 187.

Mittheilungen d. Schweizerischen Entom. Gesellschaft, Vol. XI, No. 7.

Zeitschrift f. wissenschaftliche Insektenbiologie, Vol. IV, Nos. 1 and 2.

Bull. North Carolina Dept. Agric., Vol. XXIX, No. 1.

Ann. Museo Nacional de Montevideo, Vol. VI, No. 3, pt. 3.

Mr. Davis proposed as an active member Mr. George W. J. Angell, 235 West 76th St., New York City.

On motion of Mr. Bischoff, the by-laws were suspended and the Secretary was authorized to cast a single ballot for the election of Mr. Angell.

The Librarian requested permission to expend \$10 for four book-cases to be used in storing the back numbers of the Journal in his office at the Brooklyn Museum. The request was granted.

The first paper of the evening was by Mr. Schaeffer, who exhibited the Lampyridæ which he collected in the Huachuca Mts., Ariz. He remarked that the Lampyridæ show much more than any other family the Sonoran character of the Coleopterous fauna of this region, while the Lampyridæ from Brownsville, Texas, have very few representatives of the semi-tropical fauna, the latter being more abundantly represented among the phytophagous Coleoptera. Mr. Schaeffer called attention to the genera *Euryopa*, *Discodon* and *Pectonotum*, new to our fauna, about which he made some remarks for publication in the June number of the Society's Journal, together with the descriptions of the new species. Of the 32 species exhibited 12 were new. Only two or three are also found in Mexico, which again, as Mr. Schaeffer said, shows strongly what he had stated at a previous meeting, namely, that very few of the species described in the "Biologia" are found in southern Arizona and southern or southwestern Texas. He also called attention to the close resemblance of a moth *Tripocris* to *Lycus fernandezi*, the moth mimicing the *Lycus* so closely that when on the wing they could scarcely be distinguished. Another Lampyrid, *Lycostomus laripes*, was very abundant on oak and with it occurred, but very infrequently, a Cerambycid, *Erytroleptus insignis*, which, when alive, resembles the *Lycostomus* so closely in action and color that it could be easily overlooked. Specimens of the mimetic moth and Cerambycid beetle were also shown.

Mr. R. P. Dow spoke informally upon "Nomenclature; a little of its Poetry."

This side of naming insects has been neglected since its great advocates, Linnæus, Latreille, Schrank and Westwood. To Latreille we owe the beautiful image of *Par-nassius*, with *Apollo* as its type. They are the creatures which fly around the summit of the sacred mountain of poetry, guarded by Apollo himself.

Schrank furnished *Pieris*, the flies which cluster around the fountain of inspiration. True, the *Colias* seek the mud puddle, but it is better far to see in every mud puddle the Pierian Spring than to mistake the spring for some mud puddle.

Westwood dwelt upon the followers of the great god Pan, contributing to entomological nomenclature the satyrs, dryads and other nymphs. The dictionaries are utterly wrong in deriving Pamphila from pan + phila, *i. e.*, beloved by all. Fabricius adapted the name to mean "the especial favorite and messenger of Pan, the god of Nature students." *Eudamus* Swainson is Pan's well-beloved. Hesperidæ generally are devoted to the God of the Setting Sun, *i. e.*, the west. This fact, their color and all render the Indian names given to them peculiarly appropriate.

Linnæus gave us *Sphinx* but did not carry out the imagery to the species. Like *Phanix*, they represent a re-incarnation of the Egyptian gods, demi-gods and heroes. Linnæus began and Schrank continued the Saturnians, a race of peaceful giants, archaic in form, and preceding the whole cosmogony of Zeus. Linnæus gave us *Heliconius*, the attendants flitting around the fountain of the Muses. Its type is *charitonia*, the clown, but an airy fairy clown at that.

Linnæus gave us the whole army before Troy for ten wasted years. The type of all butterflies represents the *Psyche* of his first ambition. It is *Papilio Machaon*, the physician, son of Æsculapius, and with his brother *Podalirius*, surgeon-in-chief to the Greek forces. Cuvier and Westwood were right in this assumption. Scudder, in his guess at *Antiopa*, as the type, was incorrect.

Linnæus, followed by Fabricius, named Lepidoptera after living men, but never except the minor ones, the plebeians as opposed to the patricians. The only exception is the *Huntera* of Fabricius.

Each named some Tortricids after discoverers. Hochenwarth (1789) is the only man who named a species after himself.

Mr. Dickerson exhibited a number of cases of the bagworm and the parasites which infest them. He spoke concerning the life history and habits of the bagworm, of the results of the work of various parasites and of disease in checking the spread of this economically important insect in various parts of the State of New Jersey. Mr. Dickerson expects soon to publish the result of his work on the bagworm.

In connection with the importance of disease in checking the number of insects, Professor Smith spoke of the advantages of giving more attention to this in connection with the gypsy moth and other injurious insects.

Society adjourned.

MEETING OF APRIL 22, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with eighteen members and three visitors present.

The reading of the minutes of the preceding meeting was postponed.

The Librarian reported the receipt of the following exchanges :

Trans. Wisconsin Acad. Sci., Vol. XV, Pt. II.

Berliner Entomol. Zeitschrift, Vol. XLII, No. 2.

Canadian Entom., Vol. XL, No. 4.

Zeitschr. f. Wissensch. Insektenbiologie, Vol. IV, No. 3.

Annales de la Soc. Entomol. de Belgique, Vol. LI, 1907.

Mr. Dow, chairman of the outing committee, spoke concerning the proposed excursion to Garrett Rock, Patterson, N. J., Sunday, May 3.

Dr. Zabriskie, with a very appropriate speech, presented to Professor Wheeler a number of ash trays which had been manufactured from beach-clams obtained at Rockaway Beach.

Mr. Leng exhibited a collection of *Cychnus* obtained from the eastern United States, and spoke concerning "The Northeastern Species of *Cychnus*." This paper is soon to be published, so Mr. Leng's remarks are not here set forth, but one statement of Mr. Leng's concerning the improbability of *Cychnus* feeding exclusively on snails led to considerable discussion. Mr. Wheeler brought out the point that the length of the head had been instrumental in strengthening the idea that the *Cychnus* feeds on snails. Mr. Schaeffer said that though they were fond of snails they would feed on almost any soft-bodied insects. Mr. Davis remarked that at Lakehurst he had found *Cychnus elevatus*, but with a possible exception of a few under bark he had found no snails in that locality. Evidently, therefore, they must feed on something else.

Mr. Leng's paper also mentioned Jordan's law that two closely allied species seldom occur in the same locality and that if they do their habits are different. Professor Wheeler stated that in his opinion this law would not hold good and mentioned, to support his belief, cases in which two species of ants, very closely allied, lived in the same locality and under the same ecological conditions; also of two closely allied species of sea-bean which he had seen growing together on the beaches of Porto Rico.

Mr. Davis mentioned that if the theory of mutation were correct we should expect to find closely allied forms closely associated and cited the case of his finding several allied species of morning glory in the same locality.

Mr. Davis showed a collection of *Cecropia* cocoons opened by woodpeckers and by mice. The woodpeckers pierce with their bills cocoons that are on branches sufficiently large not to give way before their blows. The birds are careful to make the holes near the center of the cocoon so as to reach most readily the pupa within. Mice, however, when opening cocoons on elder-bushes and like situations, do not work so definitely, for while they usually pull the cocoons open from the bottom, they are just as likely to make two or even three holes in them before deciding on any definite mode of procedure.

Mr. Davis also exhibited and made a few remarks on four species of *Chauliodes* from Staten Island, and a fifth one from New Jersey, these being all of the species so far known from eastern North America.

Mr. Harris spoke concerning the results of his examination of Mr. Lütgen's collection.

Society adjourned.

MEETING OF MAY 5, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with eighteen members and one visitor present.

The Librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Bolletín Museu Goeldi, Vol. V, No. 1.

Wiener Entom. Zeitung, Vol. XXVII, Nos. 4 and 5.

Deutsche Entom. Zeitschrift, 1903, No. 2.

Mr. Dow, of the outing committee, reported that eleven members were present at the field trip to Garrett Rock, Paterson, N. J., and announced that the next expedition would be to Rockaway Beach on Sunday, May 10.

The death of Professor Willis G. Johnson, recently a member of the Society, was reported and the President requested Mr. Osborn to prepare a suitable notice for publication in the next Journal.

Dr. Zabriskie spoke on the "Microscopical Examination of External Structures of Certain Heteropterous Insects of the Genera *Chariesterus*, *Leptocoris*a, *Zicca* and *Acanthocerus*." Numerous lantern slides illustrated Dr. Zabriskie's talk. The remarks were chiefly explanations of the lantern slides, projections of etched tracings of camera lucida drawings from microscopical mounts of dissections. The dissections were from external structures of both sexes of a species belonging to each of the four genera mentioned in the title, *i. e.*, *Chariesterus gracilicornis*, *Leptocoris*a *filiformis*, *Zicca taniola* and *Acanthocerus lobatus*, all members of the family Coreidæ as tabulated in Uhler's check-list, and nearly all collected in Cuba. The specimens were selected from a fine lot of Heteroptera donated to Mr. Zabriskie by Professor C. T. Baker, lately of the Agricultural Exp. Station of Cuba, and of the Museum at Para, Brazil.

The illustrations showed something of the remarkable uniformity of external structures in the family Coreidæ, so far as these have been examined. The antennæ of the successive species differ in length and contour, but all have the small, cuplike supplementary segment between the third and fourth segments; the labium varies in length as compared with the segments of the beak, the barbs of the two outer lancets vary in coarseness and number, but otherwise have the same general form. All species have the pair of peculiar stout spines, situated near the margin of the cleft and near the base of the second segment of the beak. They all have the general form of "comb" at the apex of the tibia, on the inner side of the anterior legs, apparently differing only in the number and coarseness of the spines. All have the general form of curious "wing-lock" on the under surface of the hemielytron, or anterior wing, consisting of a thickening of the distal, acute angle of the clavus, in which thickening lies a deep pit, furnished on the anterior side with one or more rows of stout, curved spines, and on the posterior side with a small prominence furnished with several rows of fish-scale-like spines and the same general form of "wing-clasp." The opposing upturned costal edge of the posterior wing, on expansion of the wings, glides into the pit, under the points of the stout spines in the anterior wing, and evidently forms a firm union in flight.

In the last species mentioned, *Acanthocerus lobatus*, there is a remarkable exhibition of secondary sexual characters. The posterior legs of the male are greatly enlarged and furnished with a formidable armature of stout spines. The female has the supero-posterior angles of the metathorax slightly protuberant, with a faint orange color. The male has the same angle of the metathorax furnished with a prominent lobe, rising from a stout base, quickly thinning out into a spatula-shaped process extending longitudinally at an angle of 45 degrees with the longitudinal axis of the insect, varying in length in different specimens, in some cases equalling one half of the diameter of the thorax, and of a striking orange color.

Professor Wheeler read an interesting paper on *Cremastochilus* which is to be published in the June number of the Journal.

Mr. Dow exhibited a specimen of *Promethia* moth which was abnormal in the shape of the angles of the wings.

Mr. Stebbins exhibited a moth, *Estigmene aceræa*, with the fore wings darker than the normal form.

Mr. Osborn spoke of finding a species of *Cheilisia* (one of the Syrphidæ) at Garrett Rock near Paterson, N. J., which had heretofore been taken only in Colorado.

Mr. Schaeffer remarked that Mr. Schott had taken a rare beetle, *Anatrichus minutus*, at Huntington, Long Island.

Society adjourned.

MEETING OF MAY 29, 1908.

Held at the American Museum of Natural History, President C. W. Leng in the chair, with sixteen members and seven visitors present.

The minutes of May 5 were read and approved.

The Librarian, Mr. Schaeffer, reported the receipt of the following exchanges:

Descriptions of New Species of South American Geometrid Moths by William Warren.

Descriptions of New Curculionid Beetles of the Tribe Anthonomini by W. D. Pierce.

Descriptions of Three New Species of Saturnian Moths by William Schaus.

On a Collection of Thysanopterous Insects from Barbadoes and St. Vincent Islands by H. F. Franklin.

Notes on some Western Orthoptera by A. N. Caudell.

Canadian Entomologist, XL, No. 5.

Verhandlungen d. k. k. zool. Bot. Gesellschaft in Wien, LVIII, Nos. 2 and 3. Tijdschrift voor Entomologie, 1908, No. 1.

Mr. Dow, chairman of the field committee, announced an excursion of the Newark, Brooklyn and New York societies to Great Piece Meadow on Decoration Day.

On motion of the secretary the June meetings of the society were dispensed with.

Professor J. B. Smith gave an illustrated lecture on the "Development of Mouth Parts in Insects." He mentioned the Thysanoptera as having the simplest type of mouth parts. The Hemiptera not having mandibles present at any stage in their development were emandibulate, while all of the other orders showed the mandibulate character at some stage in their development. He dwelt particularly upon the mouth parts of the locust as being particularly typical of the mandibulate type and pointed out the homology between these and corresponding parts of other insects. In connection with the Diptera he said that there existed in text-books a great deal of misconception concerning the homology of their mouth parts.

Professor Wheeler differed from Professor Smith in the assumption that the Hemiptera were emandibulate during their entire development and showed drawings of the early embryos of *Ranatra* and *Zaitha* as evidence. He also took issue with Professor Smith on the homology of some of the mouth parts of the Diptera.

Mr. Engelhardt exhibited a collection of Sesiidæ comprising all but three of the species recorded from the eastern United States. His remarks related briefly to their feeding habits and economic importance. He mentioned briefly the life history of several species heretofore unknown and spoke of a new species of *Memythrus*.

Mr. Barber spoke briefly concerning the species of Berytidæ. He mentioned the distinguishing characteristics of the different species, and of the capture of *Jalysus multispinosus* Ashmead at Lakehurst, N. J., by Mr. W. T. Davis. He also recorded a new species of the family from the Huachuca Mountains, Arizona. Specimens of all the species were exhibited.

Society adjourned.

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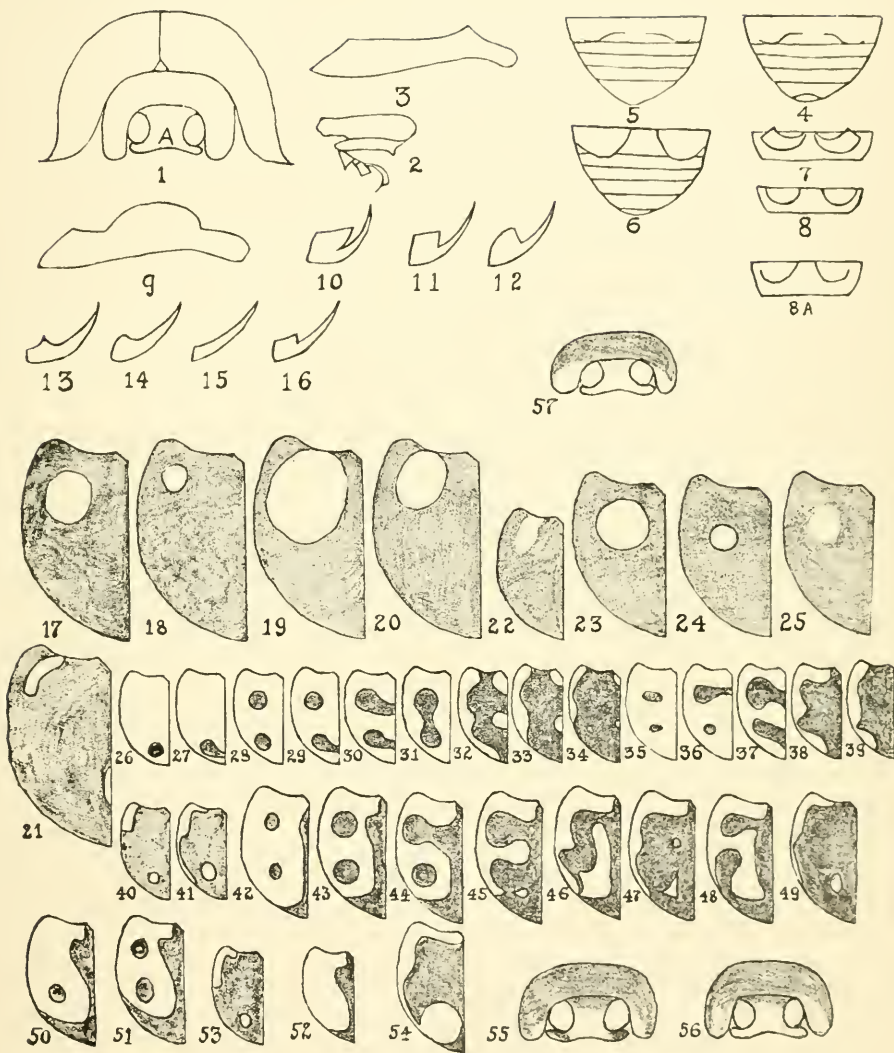
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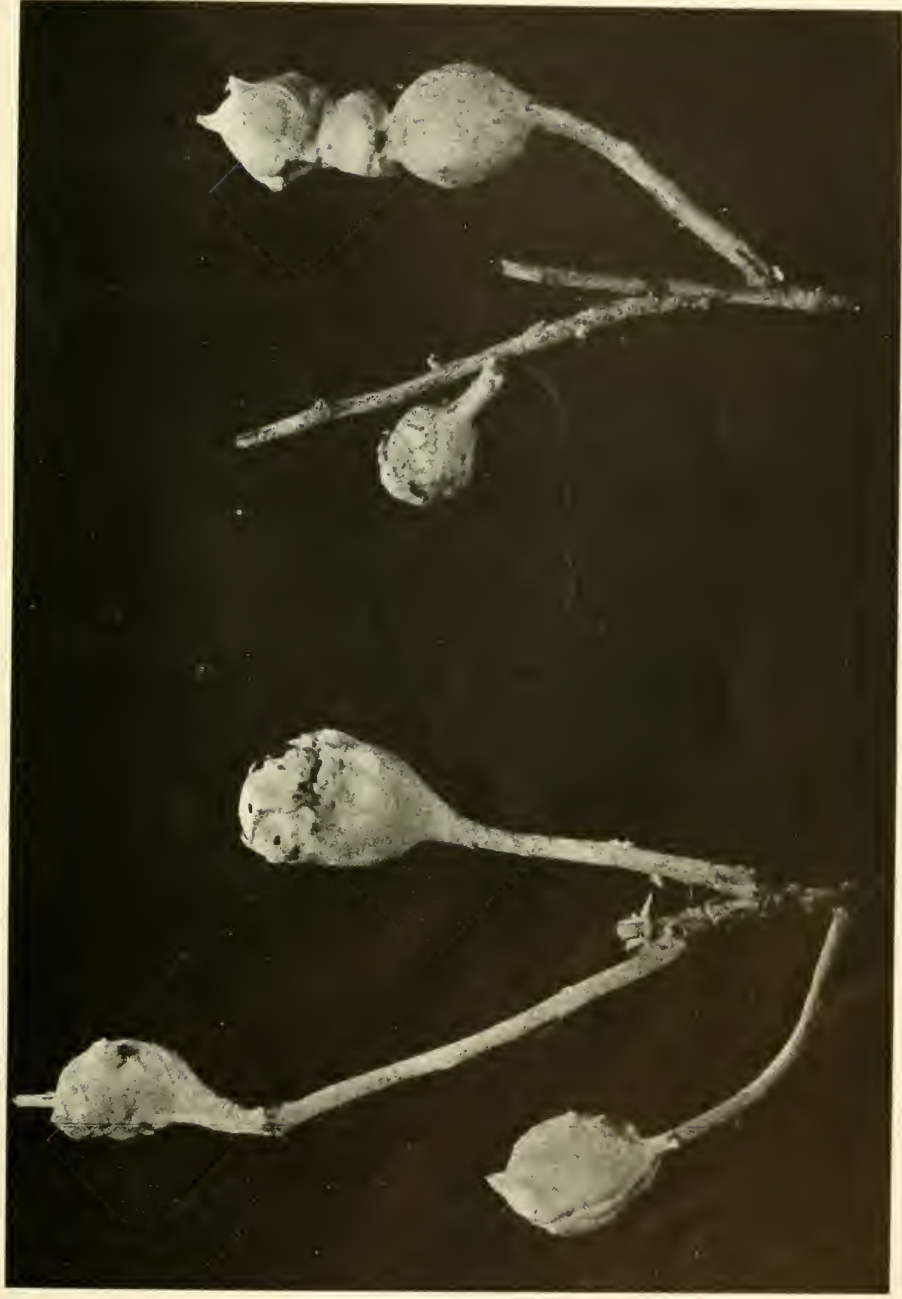
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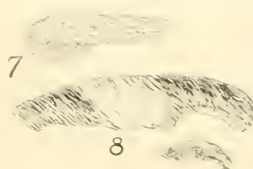
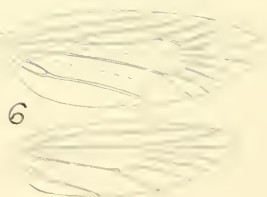
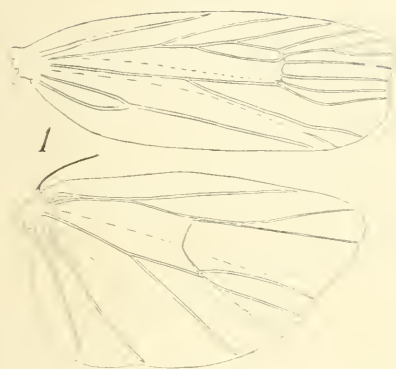
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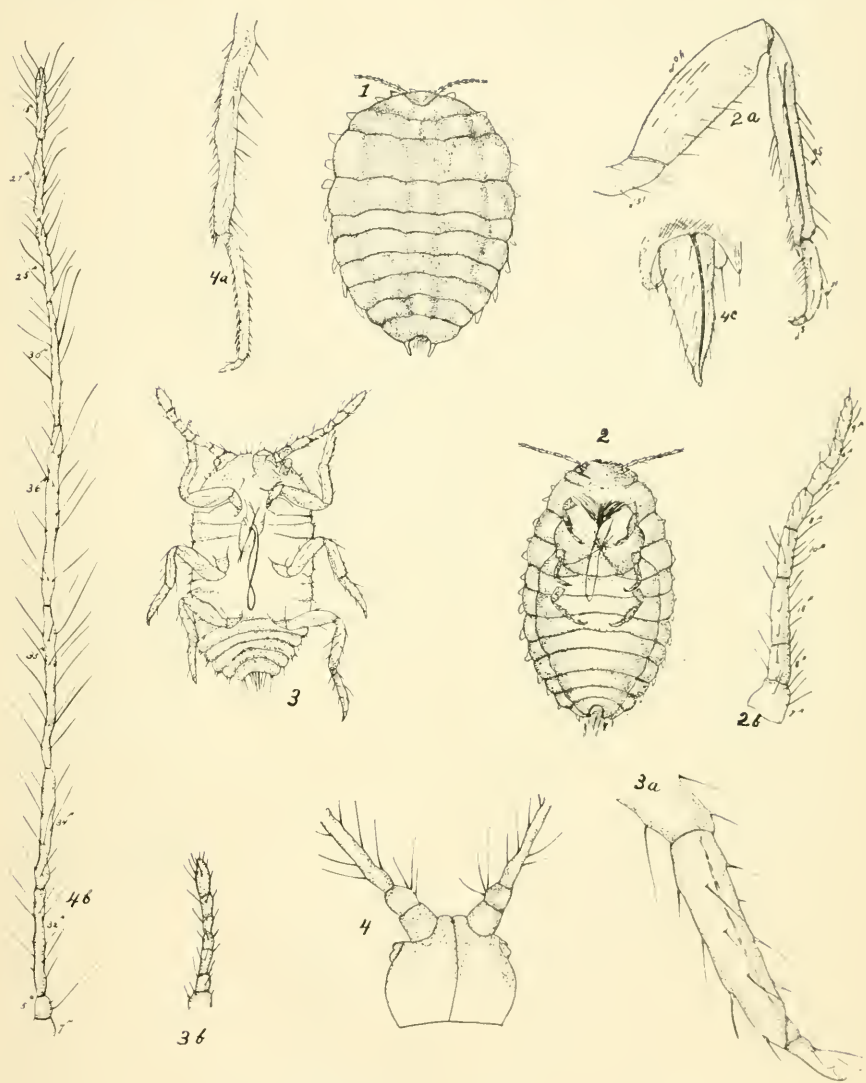
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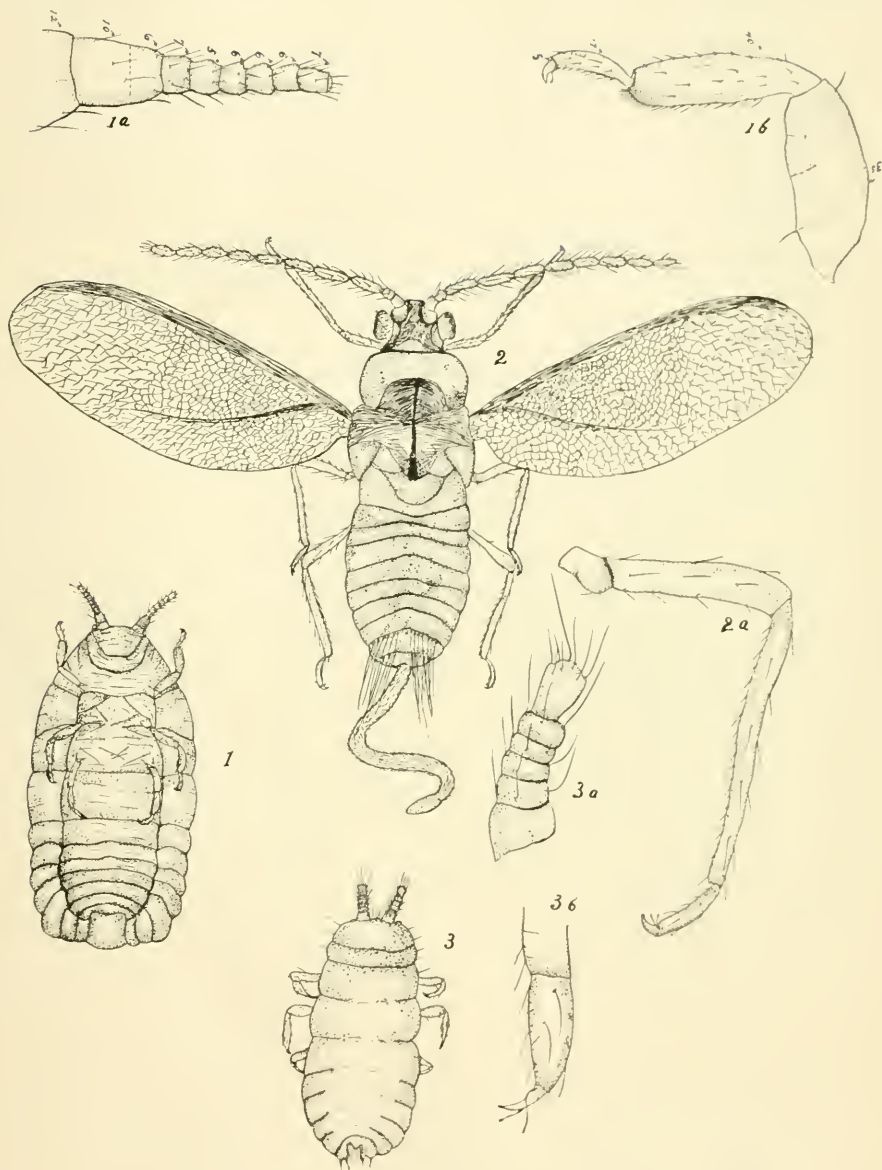
Galls of *Aulax chrysothamni* n. sp.



Tortricidae and Tineina.



Pseudococcus cupressi sp. nov.



Xylococcus macrocarpae sp. nov.

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